

**EXPERIENCES AND PRACTICES OF FORM THREE
INTEGRATED SCIENCE TEACHERS WITH REGARD TO
OUTCOMES AND ASSESSMENT STRATEGIES: A CASE
STUDY OF TWO SCHOOLS IN LESOTHO**

by

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Abstract

Studies by different academics (Marsh 1997; Allen 2004; Dunn 2006; Austin, 2010 & Stears & Gopal, 2010) reveal that outcomes and assessment strategies cannot be divorced. Outcomes and assessment strategies are meant for various purposes in education, ranging from establishing the starting point, to monitoring and evaluation of the outputs of what have been planned for the lesson. The study investigates the experiences and practices of Form Three integrated science teachers with regard to the outcomes and assessment strategies. The motivation behind this study is related to the problem that teachers are trained on discipline base while they are expected to teach integrated science in the junior level (form one - form three). Integrated Science plays a major role in the Lesotho education system because it prepares learners at Secondary School level (Form One - Form Three) to study specialised science subjects namely: Biology, Chemistry and Physics at High School level (Form Four – Form Five) and this resulted in learners' interest in science at higher education being clearly oriented (Oludipe & Oludipe, 2010). This study was achieved by investigating teachers' experiences and practices of outcomes and assessment strategies in the way they do, through the use of the following data gathering instruments: document analysis, observation and semi-structured interviews.

This study is mainly qualitative, interpretive case study of two schools and is informed by two theories namely: social constructionist theory and Bloom's Taxonomies. Social constructionist underpins social practices and practitioners' views on them. On the other side, Bloom's taxonomy provides details of construction of assessment tools towards attaining outcomes at the end of the learning period. In terms of analysing the data from the field, the data are presented using the themes and categories generated from the interviews. In addition, in presenting the data, the study would ensure that the voices of the participants were not lost. Therefore, verbatim quotations are infused in the data presentation. The emerging trends and patterns from the presented data are then outlined.

According to the findings, the teachers are more interested in their areas of specialisation from the universities and colleges and this resulted in some other parts of the syllabus being sidelined. The study also revealed that teachers still lack knowledge of stating or writing observable and measurable learning outcomes even though they are aware of the

importance of stating learning outcomes at the beginning of each and every Integrated Science lesson. The research concluded with a set of recommendations to ensure the effectiveness of the teaching of Integrated Science in Lesotho.

SUPERVISOR'S STATEMENT

This dissertation has been submitted with/without my approval.

Dr. Bheki Khoza

DECLARATION

I, Tshepiso Beatrice Khanare, declare that

- (i) The research reported in this dissertation, except where otherwise indicated, is my original work.
- (ii) This dissertation has not been submitted for any degree or examination at any other university.
- (iii) This dissertation does not contain other persons' data, pictures, graphs or other information, unless specifically acknowledged as being sourced from other persons.
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Dedication

To my nieces: Bokang, Thabo, Keke, Tlalane, Mpolokeng, Marethabile, Bohlokoa, Bonang and my granddaughters Thato and Rethabile. I hope this will be a motivation and inspiration to you because you were there when I was struggling with my life and my studies at the same time.

To my only dear son, Tholong, thank you very much for being a good boy while mum was away, respecting your grannies and studying hard as if I was still around. I love you baby boy.

To my brother Lloyd and his family, thank you for taking care of our mum and everyone at home and being a father of two families. Ampuse, thanks for your encouraging words and your care when conducting this study and for helping Akhali with Tholong. Sisi Fumie 'Kgoshi' it was hard but your support and care for my life played an important role in the achievement of this study.

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CHAPTER ONE

CONTEXT, OBJECTIVES AND OVERVIEW

1.1 Introduction

Outcomes and assessment strategies are essential in the process of learning and teaching. Stears and Gopal (2010) points out that outcomes and assessment strategies are at the heart of learning and teaching if they are linked and used in the way that they are meant to. The improvement of teaching and learning is depended on outcomes and assessment strategies and teachers as facilitators need to understand these strategies. According to the Ministry of Education (2008), there must be a link between outcomes and assessment strategies to teachers' understanding as these may lead to of development and improvement of teaching and learning. This means that teachers as facilitators are expected to indicate clearly what they expect from their learners and also to indicate strategies they would employ to measure what learners have learnt. This chapter will describe detailed history of Lesotho Education, the problem of the study, rationale and objectives then conclude by looking at a brief overview of the study.

1.2 Historical background and current context

In 1868 Britain colonised Lesotho and the missionaries were already practicing informal education before colonizers came. The missionaries and British then introduced formal education and used imperialism education system of colonizers to convert the Basotho to their religion and culture (Ngoetjane, 2002). The formal schooling introduced: primary schooling into standards that is standard one to standard seven and secondary schooling into Forms which are from Form one to Form five. The education system which was introduced into Lesotho during the colonial period was exclusive unlike the indigenous education which was more inclusive (Thelejane, 1990; Letseka, 1992; Khalanyane, 1995)

Khalanyane (1995) revealed that in 1966 Lesotho attained independence and then started reforming the content of education in a way that addresses its developmental needs. It was around the 1970s when the government of Lesotho attempts to relate

educational planning to overall national development plans. People's opinions and aspirations were taken as raw data from a series of public gathering (*Lipitso*) which were held throughout the country to serve as anchor points in directing education policy reforms (Thelejane, 1990; Seotsanyane and Muzvidziwa, 2002). The Basotho like other nations, see education as the main vehicle towards achieving the national aspirations of self-reliance and economic independence. Change of educational content and practice was seen as a central task towards achievement of those aspirations. These aspirations had been translated into education policy goals captured in several policy documents and subsequent clarification and implementation papers, as well as international conventions and protocols (Seotsanyane and Muzvidziwa, 2002).

Education in Lesotho between 1970 and late 1980 was based on passing year by year from one grade to another until one goes through Cambridge Overseas School Certificate (COSC) (Khalanyane, 1995; Motaba, 1998). Assessment in Lesotho had been driven by the idea of British colonisers where English had been the determining factor for entrance into University (Thelejane, 1990; Letseka, 1992; Khalanyane, 1995). This means other subjects were not considered to contribute towards university entrance. The methods of assessment that were dominated at that particular time were: written tests, examination and textbook exercises (Ansell, 2002). Due to the lack of apparatus and the popular method of teaching of that time, most scientific experiments were demonstrated with learners having little hands-on experience. Often experiments were not conducted at all.

The post-independence government had aspirations for changes in education that would bring about a difference from the colonial-type education. The government wanted to restructure the education system to promote education and training as a means of creating skills and attitudes (Seotsanyane and Muzvidziwa, 2002). A number of commissions were set up during the independence era, with the purpose of ensuring that the government assumed complete control of the education system. This was initially met by strong resistance from the churches, but by 1977 a break was reached and a tripartite partnership was established between the missions, the community and the government (Khalanyane, 1995).

Furthermore, in 1978 the government launched a National Dialogue (*Pitso*) in which the participants were a wide range of stakeholders such as chiefs, parents, university staff, churches, teachers and members of the interim Parliament. The result of this conference was the appointment of the 1980 Education Sector Survey Task Force, which was set up to prepare an education policy document meant to guide the government in planning an education system appropriate to the developmental needs of Lesotho, and which would promote the economic and social development of the country (Khalanyane, 1995; Motaba, 1998).

According to the Ministry of Education and Manpower Development, (2002) the policy statements were made and they were related to curriculum and assessment in a way that curriculum and assessment methods aimed at inclusive education in all levels. Also it took into consideration improvement of assessment and examination to measure competencies specified by curriculum outcomes and provides relevant information to key stakeholders in education. The policy introduced continuous assessment to check learning progress and to provide information for remedial work. All this will contribute to final examination mark. The policy aimed at promotion of principles of self-reliance and maintenance of environmental wellbeing.

The National Curriculum Development Center (NCDC) in Lesotho was mandated to review curriculum materials and syllabi. Their task focused on a review of the education outcomes, a revision of the existing syllabus, and the implementation of a whole revised curriculum at Junior Secondary level. NCDC is a body of subject panels and each panel is made up of subject specialists, and in this regard we are looking at Science specialists (Ministry of Education, 2008). They further indicate that this panel is responsible for drawing broad outcomes and assessment strategies which are uniform throughout the country. All schools in Lesotho use the same syllabus for Integrated Science. Form Three Integrated Science is the integration of Biology, Chemistry and Physics and is assessed based on the outcomes of the three disciplines (Ministry of Education 2008).

According to the Ministry of Education (2008) there are four core subjects namely English, Sesotho, Mathematics and Science and other subjects including a practical subject. They further indicate that English and Sesotho are compulsory at junior level

but at senior level it is only English that is compulsory. This means that English is the medium of instruction at secondary level in Lesotho.

The education system in Lesotho is organized into three levels, with learners attaining a different qualification at the end of each level (see Table 1.1). At Junior Secondary level, Integrated Science is one of core subjects that must be learnt by every learner (Ministry of Education and Manpower Development, 2002). Furthermore, they indicated that there are three disciplines (biology, chemistry and physics) that are dealt with within the Science curriculum.

Table 1.1 Grade level arrangement in Lesotho

Education Level	Lesotho term for different grades	Equivalent South African grade levels	Public examinations
Primary	Standard 1	Grade 1	
	2	2	
	3	3	
	4	4	
	5	5	
	6	6	
	7	7	Primary Leaving Examination (PLE)
Junior Level	Form one	Grade 8	
	Two	9	
	Three	10	Junior Certificate (JC)
Senior Level	Form four	Grade 11	
	Five	12	Cambridge Overseas School Certificate (COSC)

Public examinations are run by the Examination Council of Lesotho (ECoL) for every subject. For these subjects there is an examiner who is a teacher in his/her everyday work on the other hand this person is responsible for the setting of the examination

paper. These papers are prepared at the beginning of the year based on intended outcomes to be reached by the end of the year, based on subject syllabus. Integrated Science also has its examiners in the three disciplines (Biology, Chemistry and Physics) who work together in the setting of the examination paper of which included them. This further indicates that Integrated Science is considered by the three disciplines which are treated separately.

Makamane (2009) purports that assessment in Meholuopo College of Education's (MCE) Programmes is pencil and paper testing that does not only encourage regurgitation of content learned but is also limited in assessing other learning outcomes in various learning areas such as science. Assessment of Science at the college is on each science discipline as they are offered. Alternative or performance based assessment is used very sparingly and at *ad hoc* manner. Marso and Pigge (1993) carried out some studies that investigated teachers' knowledge on assessment and came to the conclusion that teachers need instruction in classroom assessment. Diez (2002) adds that teacher training institutions should emphasis more on instruction at both the pre-service and in-service level, to build a repertoire of strategies for high-quality assessment, and less instruction in standardised testing than is currently the case in most measurement courses for teachers.

The current intentions of the policy is to integrate curriculum outcomes and assessment strategies, examination still exert a great influence on curriculum outcomes and to a greater part, assessment is still mainly a pen and paper activity which pushes towards selection and certification (Ministry of Education and Manpower 2002). These examinations are not really assessing the affective domain and practical application of concepts and skills in most subjects. Oludipe and Oludipe (2010) points out that it is only when teachers understand what is required of them, when they have got practical guidelines concerning what have to be done, and have developed the expertise, that they will effectively carry new requirements into the classroom. For the purpose of this research, assessment is suggested in the syllabus document, learners Integrated Science textbooks past examination question papers and these are the only sources of information available to teachers.

The syllabus document puts emphasis on the development of appropriate scientific skills and attitudes in addition to acquiring knowledge (Ministry of Education, 2008). The syllabus document recommends that the following approaches should be used to achieve the broad outcomes. National Curriculum Development Center (NCDC) intends to use learner-centered approaches and methods that should be used, among others include: practical work through experiments, inquiry through investigations, and projects involving analysis, synthesis and designing of articles/ items. (Ministry of Education and Manpower Development, 2002, 1)

In 2008 the government looked upon improvement of education in general by introducing continuous assessment to cover areas that are not taken into account by examinations (Ministry of Education, 2008). Furthermore, they make a link between outcomes and assessment strategies so that by the end of the learning process, learners are contributing towards the economy of the country. There should be a link between the conceptual framework of the programme, assessment and the use of performance based assessment over time in the teacher education programme. These requirements call for a new understanding of the relationship among standards, learning experiences and assessment. The learners rely almost completely on the day-to-day and term-to-term assessments of achievement as conducted by their teachers and this is the area where teachers are lacking in both the theory and practices.

1.3 The problem of the study

Integrated Science plays a major role in Lesotho's education programme as it is designed to prepare learners at Secondary School level (Form One - Form Three) to study specialised science subjects namely: Biology, Chemistry and Physics at High School level (Form Four – Form Five) which in turn brings about learners' interest in science oriented courses at higher education (Oludipe & Oludipe, 2010). However, the training of Science teacher at National University and Meholuopo Collage of Education is discipline based outcome, where teachers are trained in their areas of specialisation as Biology teachers, or Chemistry teachers, or Physics teachers. This becomes a problem when they get into schools and have to teach Integrated Science.

Many of these teachers have not experienced integrated science practices during their pre-service training (Austin, 2010). Much of their pre-service training focused on the discipline-based knowledge as an outcome (Oludipe & Oludipe, 2010). Outcomes and assessment strategies in Integrated Science need to be suitably handled so that learning will assist and guide learners when they proceed to higher levels. Therefore, understanding of outcomes and assessment strategies of Integrated Science becomes very crucial in the teaching and learning of Integrated Science in junior secondary education in Lesotho.

1.4 Rationale and objectives of the study

Despite the fact that teachers experience the problem of discipline-based knowledge in their pre-service training, some teachers perform perfectly in their schools while others perform badly in the teaching of Integrated Science. For example, the results of Junior Examinations in 2010 indicate that some schools achieved 100% pass in this subject while others schools failed to. This performance had been shown also in the past years' Junior Examinations in Integrated Science (Ministry of Education, 2010).

This study is also prompted by Lesotho Science and Mathematics Teachers Association (LSMTA) which is interested in finding out why some schools perform better than others in Form Three Integrated Science. According to LSMTA, (2006) one of their objectives states that teachers are responsible to ensure that there is alignment between teaching methods, assessment strategies, and learning outcomes. They further indicate that they are also interested in helping teachers to make learning experiences more transparent so that the connection between teaching, assessment and learning outcomes become clearer. Therefore, this study is trying to investigate the outcomes and assessment strategies as understood by teachers in Form Three Integrated Science with the aim of addressing the problem that they are trained on discipline base while they are expected to teach integrated science in the junior level (form three).

Personal and research imperatives motivate me to conduct this study. Personal experiences of my colleagues show that outcomes and assessment strategies in Integrated Science are not clearly understood by teachers. Research by Willingham (2004) indicates that assessment strategies should be closely linked with learning

outcomes. In addition, Ferns and Aziz (2005) point out that it is important when learning is linked to a clear statement of what learner is expected to achieve and how he or she is expected to demonstrate that achievement. Therefore, science teachers need to be clear about what learners are required to learn and what assessment strategies are required in an Integrated Science classroom. Outcomes and assessment strategies need to be clearly defined so that teachers may provide constructive feedback to learners. Atlas (2006, p. 435) indicates

The major aspect of assessment strategies is for teachers to assess whether learners are making progress towards achieving the outcomes. And also assessment strategies are meant to produce significant and often substantial learning outcomes. Teaching and learning is the process that needs to be monitored and supported by assessment.

This indicates that improvement in learning and teaching is driven by considerable learning outcomes that are well monitored during or/and after the lesson. Learners' ability to demonstrate knowledge, skills and attitude could be well monitored and corrected.

Assessment is important because it informs teachers and learners about the learners' progress so that teaching and learning improves (Atlas, 2006). The researcher have been a science teacher in secondary schools for the past thirteen years and learnt that understanding of concepts make practice simpler, but more importantly, teachers understanding of outcomes and assessment strategies inform their practice in Form Three Integrated Science. The major aspect of assessment is to inform teachers and learners about learner's progress in order to improve his or her learning (Austin, 2010) and hence the clearer picture about achievement of stated outcomes or where gaps may occur. This is possible in a situation where assessment includes feedback which is descriptive.

According to Frye (2010) assessment strategies can become deep-rooted in the teachers' pattern of practice and become an essential part of their survival. That is teachers' understanding of assessment strategies and outcomes in Form Three Integrated Science plays an important role in the learning and teaching of Form Three Integrated Science (Oludipe & Oludipe, 2010). Based on the above, the rationale for the study is an attempt to investigate teachers' experience and practice of Form Three Integrate Science with

regard to assessment strategies and outcomes. In this context, the rationale is centred on teachers understanding which inform their practices. Therefore, clear outcomes and assessment strategies together with teachers understanding may contribute to learners' achievement in science education.

The results from this study could be used to guide science teachers, policy makers or other interested individuals or groups to compile a set of guidelines on the effective outcomes and assessment strategies of science.

1.5 Key questions of the study

The study aims to understand the experiences and practice of Form Three Integrated Science teachers with regards to outcomes and assessment strategies. The study further attempt to understand why the teachers experience the outcomes and assessment the way they currently experience. This investigation is therefore driven by two research questions:

1. What are the experiences and practice of Form Three Integrated Science teachers with regards to outcomes and assessment strategies?
2. Why do the Form Three Integrated Science teachers experience and practice outcomes and assessment strategies the way they do?

To answer key question one, the researcher collected data through document analysis of Form Three Integrated Science syllabus, Form Three Integrated Science teacher preparation books prescribed, Integrated learners Science text book, prescribed Integrated Science teachers guide, assignment and examination question papers with the intention of identifying outcomes and assessment strategies of Form Three Integrated Science. This key question and key question 2 will also be answered by participant-observation (two per teacher of about 40 minutes) and semi-structured interview (only one per teacher of about an hour).

1.6 Significance of the Study

The significance of this study is that, the finding may be used to guide science teachers, policy makers or other interested individuals or groups to compile a set of guidelines

also to compile guidelines for teachers and learners that promote better outcomes and better assessment practice.

1.7 Key words

In the context of this study, broad meanings that are attached to the core concepts are as follows:

- *Teacher* a common term that refer to a person giving schooling to students (Shakeshaft, 2004). This concept is commonly understood as an educator in the South African context, referring to somebody who works with learners in a classroom and facilitates their learning or anybody who is a source of knowledge and who guides young people to adulthood. In addition, Deacon and Parker (1997) define a teacher as a person who performs classroom and managerial duties in the education place and in constantly engaged in assessing both his/her learners and his/her own performance and also acts as facilitator of the learning process.
- *Broad outcomes* refer to operational target and priority strategies in education system (Mioduser, Richard and Gong, 1998).
- *Subject outcomes* refer to skills and techniques learnt and applied in real life (Rice, 1996).
- *Learning outcomes* refer to the achievement of learners rather than the intentions of the teacher normally expressed in aims of the subject (Pfaffenberger, 2002). Learning outcomes can be stated in a way that covers the range of necessary competences and emphasises the integration of different competences at the end of learning period. (Ramsden, 2003).
- *Assessment strategies* are ways that provide valuable information to both teachers and learners. Each strategy offers unique methods and instruments (Mioduser, Richard and Gong, 1998).

- *Integrated Science* is a combination of Biology, Chemistry and Physics (Ministry of Education, 2008). IRP (2006) regard Science as content organized around Life Science, Physical Science, and Earth and Space Science.

1.8 A Brief Overview of the Study

The remaining sections of the study will focus on the following aspects: literature review, research methods and analysis, findings and recommendations of the study based on the data obtained.

1.8.1 Literature Review

The literature review looks at how previously conducted studies and researches relate and state the outcomes and assessment strategies of Form Three Integrated Science as understood by teachers. Again literature review gives ways that might have been taken to overcome obstacles. It explores research into effective schooling, different areas of involvement of outcomes and assessment in the learning and teaching of Integrated Science.

This section also takes into consideration, from the research literature, possible ways that teachers might use to make effective learning of Integrated Science from the way in which they state the learning outcomes and ways in which they use correct instruments to check learning progress at the end of the learning period. Despite the problem of being trained in discipline-base outcome of Science, some schools had a lower pass rate in the 2010 Junior Examination while others performed very well under similar conditions. Clear evidence was highlighted in a study conducted by Stears and Gopal (2010). Their study focused on connections between poor pen and paper tests and failure to state measurable and observable learning outcomes. It has shown that there are schools that do exceptionally well in Integrated science under situation where teachers are struggling to state measurable and observable outcomes and to use appropriate instruments to measure learners understanding:

This made us realise that we were not assessing everything the children were learning and prompted us to consider alternative assessment

strategies in a way that covers stated learning outcomes. (Stears and Gopal 2010, p. 592)

This simply indicates that assessment strategies and learning outcomes in the learning of Integrated Science in Form Three need to be connected to the teachers' understanding. This also indicates that in most instances teachers' commitment, hard work and ability to ask for guidance leads to high learner achievement.

1.8.2 Research method and design

This chapter will highlight the theories informing the study: social constructionist theory and Bloom's Taxonomies. The sample for this study consists of Integrated Science Teachers, males and females whose training had been on discipline-base outcomes of Science. The research will follow a multiple-method of data collection, where the researcher would use document analysis, participant observation and semi-structured interviews to get to a deeper understanding of teachers' understanding of outcomes and assessment strategies of Form Three Integrated Science.

Ethical issues were considered as there were informed consent letter to the Education Office, Principals and participants to ensure confidentiality, anonymity and freedom to withdrawal at anytime. The research design, its theoretical framework and the design of the instruments of data collection were described in detail. As already mentioned above, for the sake of fairness the study followed a multiple-method approach of data collection.

1.8.3 Data Analysis

Guided Analysis led by theories of enquiry and concepts of the study will be used so that, where necessary, principles could be changed in order to accommodate all the data collected.

1.8.4 Findings and Recommendations

The chapter on findings and recommendations describes the research findings and recommendations, responding to the data collected the findings of the study, as well as in themes generated from guided analysis. One of the main insights is teachers' understanding of Form Three Integrated Science outcomes and assessment strategies. The other insight is the challenges that teachers come across when the learning outcomes are not clearly stated, measurable or observable. Lastly, the recommendations for the LSMTA will be suggested towards addressing the question why some schools perform better than others?

1.9 Chapter summary

The rationale and purpose of the study attempts to explain that the study is not just centered on the teachers' understanding of outcomes and assessment strategies of Form Three Integrated Science; but it also tried to understand why some schools perform better than others in Form Three Integrated Science. This chapter also described the context of the study and gave the research questions which the research is designed to answer. This was provided to help the reader to understand why the research was done and why it was important, in the Lesotho context, to conduct the research. Then Chapter Two is literature review, Chapter Three discuss paradigm and theories of inquiry, Chapter Four looks at methodology and design of the research, Chapter Five discuss the research finding and analysis lastly, Chapter Six deals with conclusions and recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The previous chapter discussed the rationale and purpose together with the research question which the research is designed to answer. This section focuses on reviewing related literature to the objectives of this study starting with history, developing and developed policies that have impacted the teaching and learning, then an overview of outcomes and assessment strategies. Form Three in Lesotho is sometimes considered as the junior level called Junior Certificate (JC). According to the Ministry of Education (2008, p.3)

The Ministry of Education and Training has embarked on the review of the entire primary and secondary education curricula with the purpose of making education at these levels accessible, relevant, and efficient of the best quality. In that regard, the ministry has developed the Curriculum and Assessment Policy Framework (the framework) which is to guide the transformation of teaching and learning as well as outcomes and assessment at these levels.

In Lesotho, the Central Inspectorate is a department of the Secondary Education Division of the Ministry of Education and Training. It was established in 1989 with the purpose of improving the quality of the country's Secondary Education through monitoring and evaluation of the country's secondary education institutions, using a variety of systematic and wide-ranging strategies of assessment in connection to the outcomes (Ministry of Education, 2008). That is, secondary education in Lesotho is based on outcomes which are divided into broad outcome, subject outcomes and learning outcomes given by the National Curriculum Development Centre (NCDC).

Furthermore, the learning outcomes for Form Three Integrated Science in Lesotho are generated according to Bloom's Taxonomies, namely levels of cognitive, skills and values / attitude (Forehand, 2005). He further indicates that taxonomies are intended to develop a method of classification for thinking behaviors that were believed to be important when it comes to linking of outcomes and assessment in science. This implies that clearly stated outcomes and assessment strategies have evolved from efforts to improve the quality of educational outcomes by continually improving teaching and learning.

According to Pitout (2009) outputs are the main focus in the learner-centered model: what knowledge have learners actually acquired, and what abilities have they actually developed? He further indicates that implicit in the learner-centered model is the idea that teachers are facilitators of learning. It is not enough to construct a syllabus and present information; the job of teachers now involves creating and sustaining an effective learning environment based on a wide range of "best practices" in teaching and learning (Ministry of Education, 2008). In this case teachers' experiences and practices of assessment strategies contribute towards achieving preferable outcomes in science class as they would understand what to assess and the correct instruments of assessment.

Allen (2004) indicates that the growth of the assessment movement during the last decade has demonstrated that assessment is becoming an important tool for better understanding and responding to the needs of an increasingly diverse student population. She further indicates that schools, Colleges and universities are increasingly turning to both nationally developed and locally designed assessment methods and instruments as a means of improving teaching and learning practices. Allen (2004) and Dunn (2006) in their research indicates that assessment research has provided useful information and insights on how students learn and what students learn, going beyond traditional measures that provide useful but limited student and programmatic data. For this study, the rationale for the increased focus on the development of assessment programs in schools is grounded in the belief that collecting systematic data improves awareness of how well students can integrate content, skills and attitudes.

The fundamental role of assessment is to provide a complementary methodology for monitoring, confirming, and improving learning (Austin, 2010). This role is applicable to all schools. Austin (2010, p. 446) further indicates:

...shifting from teacher-centered method to learner-centered has shown many important implications in the learning and teaching environment. Firstly, learner-centered programs are output-oriented. Secondly, learner-centered programs are competency-based. Learning objectives and learning outcomes are tied to the most important skills and knowledge in a classroom. And lastly, learner-centered education is dedicated to continual improvement through ongoing assessment of learner learning.

By monitoring the effects of programme changes on learning outcomes, Form Three Integrated Science teachers are enabled to identify problem areas and to design improvements. Teachers' experiences and practices in their everyday teaching of Integrated Science may result in the ability to identify problems and to rectify them for better teaching and learning.

Assessment is an iterative process for gathering, interpreting, and applying outcomes data from courses, programmes, or entire curricula to improve programme effectiveness, particularly as measured by student learning outcomes (Austin, 2010). Austin further indicates that assessment involves more formal contexts and procedures including written and timed tests assessed under strict conditions with the purpose of getting positive outcomes. Effective learning and teaching is based on clearly stated learning outcomes and assessment strategies which are characterised by being observable and measurable.

Teachers need to understand the importance of having clearly stated learning outcomes in order to choose the best learning assessment strategies and this could be possible when teachers plan the assessment implement and then gather information about the outcomes (Willingham, 2004). In addition, Angelo (1999) states that explicit identification of learning expectations facilitates the educational coherence about their goals. Angelo further indicates that sharing those expectations explicitly with learners can provide an effective learning scaffold on which learners can build their experiences and render effective performance. This implies that, outcomes can be specified in a developmental hierarchy, where possible.

The Ministry of Education and Manpower Development (2002) outline a number of approaches that are needed to develop effective plans for assessing student learning in the major. These include identifying goals and objectives, describing instruments or methods for assessing students' achievement at important stages of learning and lastly determine how the results will be disseminated and used for teaching and learning improvement

Firstly, Ministry of Education and Manpower Development (2002) define goals and objectives for the major or program for example Secondary Education: a department's

instructional goals and objectives serve as the foundation for assessment planning. Program assessment is intended to provide information on how well students are performing relative to the educational goals and objectives established by the department. The defined goals and objectives should be far-reaching and describe a variety of skills and knowledge-based areas. In most instances, not all of the goals and objectives can be adequately assessed for student achievement. However, assessment plans should be devised to assist in schools in determining whether students are acquiring some of the prescribed goals. Clearly, departmental goals for the major must ultimately be integrated with those of the school/college, which in turn, must be aligned with the institutional mission statement.

Secondly, Ministry of Education and Manpower Development (2002) identifies and describes instruments or methods for assessing learner achievement at important stages in the program that is: once educational goals and objectives have been identified, assessment methods for collecting student data can be chosen. These methods should be consistent with the programmatic objectives defined in the first step. Because departments often define a variety of educational goals and objectives, comprehensive assessment strategies frequently require the use of more than one assessment instrument to determine program effectiveness.

Lastly, Ministry of Education and Manpower Development (2002) determine how the results will be disseminated and used for program improvement this involve assessment results and information should be used in a timely fashion to facilitate continuous programmatic improvements. Designing a feedback process is essential in all assessment plans because it gives faculty the opportunity to use recent findings to incorporate curricular changes necessary to prepare learners with the skills and knowledge to advance in their respective majors. For example, when assessment results are used in a timely manner, Ministry of Education may determine that it is necessary to provide curricular changes to enhance teaching and learning weaknesses. When results indicate that learners are performing consistently with established objectives, faculty may focus assessment initiatives in other areas or extend current practices to impact additional learners.

Assessment encompasses everything from statewide accountability tests to district benchmark or interim tests to everyday classroom tests. In order to grapple with what seems to be an overuse of testing, teachers should frame their views of testing as assessment and that assessment is information. The more information teachers have about learners, the clearer the picture they have about achievement or where gaps may occur. In the next section, assessment will be considered as given by other researchers.

2.2 Assessment strategies

These are ways that provide valuable information to both teachers and learners. Each strategy offers unique methods and instruments (Mioduser, Richard and Gong, 1998). Furthermore, the Ministry of Education (2008) sees this concept as a way of improving the learning process and achievement of the curriculum goals and educational aspirations and these strategies are developed by subject specialist (subject panels) to assist their colleagues; they are suggestions only. This means that the reliance on summative paper and pencil examinations should be supplemented by authentic assessment strategies that indicate what the learner knows and is able to do. Agreeably, IRP (2006) consider assessment strategies as a variety of ways to gather information about learners' performance. In addition, Khatru, Kane, and Reeve (1995) consider assessment strategies as a direct measure of what has been learned which is particularly relevant to the goals and objectives. They further indicate that assessments strategies are meant to relate to specific activities while on the other hand addressing general broad outcomes or objectives.

According to Blaz (2008) assessments help teachers in learning more about their learners because it can reflect learners' learning, achievement, motivation and attitude on instructionally relevant classroom activities. The power of assessment has been seen by many researchers such as Marzano, Pickering and Pollock (2001) and Blaz (2008) as instructional strategy which identifies providing feedback on the progress and needs, and adapt instructions to suit current needs. Pollard and Triggs (1997) add that assessment provides the base for the teachers to prepare for the next planning. This implies that assessment enhances understanding and growth of learners in terms of knowledge gained in a classroom and therefore gives the teacher a way forward or some loop holes for every particular lesson.

Furthermore, Suskie (2004) defines assessment as the ongoing process of getting clear, measurable expected outcomes of learners' learning when ensuring that enough and good opportunities are given to learners to achieve those outcomes. Agreeably, Mitchel (1989) and Department of Education (2002) define assessment as process of gathering evidence using a number of strategies about individual learners' competence. Moreover, Department of Education (2002) sees it as the process of making decisions about the learners' performance.

Furthermore, Angelo (1999) asserts that effective assessment planning can only occur when properly supported with appropriate time, money, and recognition for good work. Angelo further shows that the expansiveness of the assessment plan will depend on those resources. As resources permit, additional measures can be added to planning. These measures address variations in learning style, differences in types of learning, and interests from variable stakeholders. In addition, Dunn (2006) believes that continuous assessment plays an important role in the teaching and learning of Integrated Science. Dunn further points out that better assessment practices involves spreading out assessment activity throughout the year and across years rather than conducting a marathon short-term assessment effort in a single year. Projecting a schedule of regular formal reviews can facilitate appropriate interim activity. This indicates that the area of learning with weakness will be easily recognised during the learning session.

2.2.1 Purposes of assessment

When looking at the National Policy the Ministry of Education (2008) indicates that the assessment of learners should serve the following purposes:

- 1) Determine whether teaching and learning is successful and leads to the stated outcomes.
- 2) Report to parents and other stakeholders on levels of learners' achievement.
- 3) Maximise the learner's access to knowledge, skills, attitudes and values as given in the syllabus.
- 4) Provide information for evaluation and review of learning programmes.
- 5) Determine whether learning is taking place and whether difficulties are being encountered and resolved.

Based on the above stated purposes, Marsh (1997) thinks that a diagnosis of the learning that has occurred, and monitoring of progress are the major reasons for assessment. He also thinks that the diagnosis should work towards helping each learner's understanding or his/her weaknesses and also to help the teacher about where to direct his/her instructions. Likewise, Allen (2004) shows that assessment can serve a dual purpose that is: assessment can promote learners' learning or provide evidence for accountability requirements through an evaluation of strengths and weaknesses. Wherever possible, learners should experience a direct, positive benefit from their participation in assessment activities.

Furthermore, Lambert and Lines (2000) consider assessment as the process of gathering information, interpreting, recording and using the information about the learners' responses to educational tasks. They further indicate that the four purposes of assessment are: firstly to provide information about the level of learners' achievement at the end of school, secondly to provide feedback to teachers and learners about the learning progress to support learning, thirdly to contribute to the information on which effectiveness or quality of individuals and institutions in the education system as a whole. They further mentioned that it involves more formal contexts and procedures including written and timed tests assessed under strict conditions. Many groups and individuals use assessment for different purposes in the education system (Frye, 2010).

Moreover, Nagy (2000) suggests that there are three roles of assessment; gate keeping, liability and instructional diagnosis. That is policymakers use assessments to monitor the quality of education and to formulate policies. Administrators identify programmes strengths and weaknesses to plan and improve programmes. On the other side, teachers use assessment to perform individual diagnosis, monitor learner progress, and carry out curriculum evaluation and to determine grades all based on outcomes. And finally, parents and learners use assessment to assess learner strength and weakness, determine school accountability, and to make informed educational and career decisions (Diez, 2009). Agreeably, Atlas (2006) explains that assessment is the term typically used to describe activities undertaken by a teacher to obtain information about the knowledge, skills and attitudes attained by the learner.

According to Lubisi (1999) grading of learners come from assessment and this grading is one form of stratification whereby learners are divided according to their ability. Based on the marks obtained by the learners, then the teacher determines positions for individual learners and this is considered as competition amongst the learners. In learning and teaching it important to focus on personal improvement than completion amongst the learners as this does not build their competence in knowledge, skills and attitudes.

Blaz (2008) also sees assessment as a daily ongoing process which plays an important role in many ways. This process can be formal or informal with the purpose of achieving stated objectives at the end of the lesson. Agreeably Ornstein and Lasley (2004) considered assessment as a major tool of instruction at the end of each learning unit which is based on teacher made quizzes, tests, and homework, or it could be administered throughout the term on informal or formal teacher observations of learners. Assessment is therefore essential in everyday teaching and learning and the teacher can use various assessment methods as shown by Ornstein and Lasley (2004).

Observation, which is the most frequently used method in everyday learning, reminds the teacher of the invisible learner in a class. Secondly, discussion, questioning and listening are also considered to be the most important and natural way by which the teacher forms formative assessments (Ornstein & Lasley, 2004). The advantages of assessment are that it provides immediate feedback and encourages whole class participation which helps learners to understand and contribute to classroom activities and help those who have poor writing skills to participate orally. However, oral activities pose some challenges in the form of managing learners if a class is too big. This simply implies that the teacher has to check learners' understanding and knowledge in an extreme flexible manner so as to give all learners from different backgrounds, a chance and an opportunity to learn.

In order to have an effective assessment process Torrance and Pryors (1998) suggested that there must be a clearly planned incidence so that the goal of teaching is corresponding with the learner achievement goal. Pollard and Triggs (1997) support this idea by showing that in everyday planning there must be intentions/purposes/goals

which need to be achieved in different ways that is through presentation, discussion, tests and others. They further show that assessment is backed by appropriate subject knowledge and pedagogic skill and a descriptive feedback.

Race (1999) argues that assessment involves giving feedback afterwards which is important as this enhance learning. He further indicates that feedback is not about tick where answers are correct or crosses where the answer is wrong but written comment that will help learners to understand where they went well or wrong. This implies that the feedback that comes after a long time end up being meaningless towards the assessment that was given as it cannot address the learners' current need. Feedback given to learners may include three important aspects, namely: diagnosing learners' difficulties during learning, assessing improvement over time and providing necessary information concerning how to improve their learning. This means that lack of these may brings unbecoming intervention that can causes lot of confusion to learners. That is, unplanned assessment is like a way with no destination.

In addition Ornstein and Lasley (2004) affirm that the use of variety of assessment helps the teacher to gather information about the progress of learners and this is most effective and helpful if it is based on clearly stated objectives. Race, Brown and Smith (2005) define assessment in terms of validity, authenticity and reliable. They maintain that assessment should be motivational, fair, equitable, formative, timely, incremental redeemable demanding efficient and manageable, promote deep learning and lead to demonstration of acquired skills and knowledge. This indicates that assessment should be valid and reliable. These two aspects plays important role in assessment and will be discussed below.

2.2.1.1 Assessment tasks

According to Marsh (1997) assessment tasks are concrete performance tasks designed to be part of everyday teaching and learning which are used in a regular classroom. These tasks are activities designed to assess a range of ability, skills and attitudes towards clearly stated outcomes and these include:

- Assignments/ homework
- Tests and

- Examinations.

2.2.1.2 Assessment of Integrated Science

The purpose of this study sought to investigate teachers' experience and practice in regard to outcomes and assessment strategies. It is important to consider at the stated purpose of assessment (*under 2.2.1*) above because teachers are responsible to check learners progress in achieving the expected outcomes and to report to parents and guidance and also to check achievement acquired by learners during the learning process (Ministry of Education, 2008).

Ministry of Education (2008) sees assessment as an item with sub-component which are considered to play fundamental role in education. The sub-components are meant to: model, monitor and inform. Looking at 'inform' part of assessment, feedback will be considered. At its roots, assessment is communication process between the learners, the teacher, and the parents about the progress of the learners. According to Makamane (2009) assessment is a continuous communication process between teachers and learners. In the same way Austin (2010) points out that a clearer picture about achievement is possible where assessment includes descriptive feedback to learners.

Assessment in anyway can be stressful, that is to assessor and assessee, or for all people involved. Oludipe and Oludipe (2010) in their study indicate that one hundred and twenty Junior Secondary Schools in Nigeria were involved and teachers from these schools did not want a total dismissal of assessment no matter how stressful it turned to be. Oludipe and Oludipe encouraged teachers to practice assessment in a way that could be best and they need to include the following: provision of feedback, make assessment part of learners' work, use information from assessment to improve instructions, used various / different types of assessment to assess learners learning which would be based on outcomes (Oludipe and Oludipe 2010). Frequent use of learner assessment could improve their performance.

According to the Ministry of Education (2008) assessment should be used to assess learners upon clearly stated learning outcomes. In Lesotho, Form Three Integrated Science is assessed against the outcomes, to collect evidence of learner achievement and

for information that is to understand and then assist the learner's where there are gaps or to improve process of learning and teaching process (Ministry of Education, 2008)

However, Nitko (2004) argues that assessment in the past has been used as the means of certification and accountability and it was done through tests and examinations which were the traditional way of assessing learners' performance. Therefore assessment is real because learners apply the knowledge they have acquired in real world as they show in tests, practical and in assignments. Therefore, this study will consider the definition of assessment as given by Atlas (2006).

According to IRP (1996) for the twenty-first century it is a challenge as the world is changing globally and economically the current trends argues for alternative vision of today's assessment in Integrated Science. They further asserted that Integrated Science teachers were also concerned and hoping to produce assessment strategies that do more on measure a person's mind. In their study, Stears and Gopal (2010) points out that a substantive body of research indicates to the inadequacy for the traditional model of assessment as this assessment is unable to deal with the trends towards a broader purpose of assessment. In their study they find out that integrated science assessment strategies should assess learners' acquisition of humanistic and cultural content taught. Humanistic and cultural content include understanding of social issues, improved attitudes towards science and learning, modest gain in thinking skills such as application of formal science in everyday life, critical and creative thinking and decision making. In this way integration of biology, physics and chemistry topics in the Form Three Integrated Science will contribute positively towards understanding humanistic and cultural content. In addition, Gipps (1998) prompt that these improvement are dependent on the content, assessment strategies that are able to assess competences. This implies that assessment strategies help to check if outcomes have been achieved and teachers' practices in their daily teaching contribute toward achieving or not achieving the expected outcomes.

On the other hand (formative assessment) continuous assessment is used to check the learning progress. Ministry of Education (2008), suggest the use of continuous assessment by teachers for diagnosis of learning difficulties to identify areas requiring

remediation. This is done in terms of quarterly tests, course work, and the marks for continuous assessment are used to monitor the performance of learner while national assessment (summative assessment) is used to assess the performance of the educational system. At this level, learners are awarded certificates of showing that they acquired knowledge and skills.

Ecclerston (2003) indicates that integration of formative and summative assessment is important in the learning and teaching of Form Three Integrated Science because summative assessment is carried out through collection of smaller pieces of continuous assessment (course work) or through gathering completion of units. He further indicates that summative assessment can simultaneously act as formative assessment in which learners may get developmental feedback on each assignment or element before proceeding to the next one. The integration of summative and formative assessment assist teachers in giving feedback and in leading to achieving outcomes in the way that they have been stated.

2.2.1.3 Assessment of Integrated Science in Lesotho

Assessment of education is done at three levels of the schooling system in Lesotho. There is Primary School Leaving Certificate which is used for selection into secondary education. This certificate is written after seven years of primary education. At secondary level learners write a Junior Certificate (JC), which is written after three years of schooling. This provides selection to a higher level of secondary education which is two years, after which an O'Level examination (Cambridge Overseas Certificate) known as COSC is written.

However, assessment of Form Three Integrated Science in Lesotho is in the form of examinations (summative assessment) that are used for selection of learners to higher education levels. Formative assessment is also used during the course of the year to check on learners' progress, and to find areas that need attention. In the process of developing scientific, social, entrepreneurial and technological skills to promote independent and critical thinking in solving socio-economic problems the Ministry of Education is using assessment to check performance at all learning areas per learner and all learners are assessed (Ministry of Education, 2008). They used examinations to

assess acquired knowledge and skills as defined by the curriculum namely: knowledge with understanding, application and interpretation, problem solving and analysis, critical thinking and evaluation through various modes: paper and pencil tests, objective tests, coursework or alternative to coursework papers, practical tests or projects or alternative to practical papers.

Assessment of Form Three Integrated Science in Lesotho will be looked at, at the level of the junior education. The junior examinations are fully under local control. There has been a concern that there is disunity between the JC and COSC examinations. Some people have argued that continuity and unity between the two could be achieved if full localization of the COSC is realized (Ministry of Education, 2008). The localization of the marking of COSC examinations was formalized in 1995.

In Lesotho, the setting of COSC examinations remains in the hands of external examinations body. These examinations give a summary of learners' level of achievement at the end of secondary school. According to the Ministry of Education (2008), the nature of Integrated Science as a curriculum objective would seem to require actions that go beyond attempting to develop learners' ability to undertake more open-ended practical investigations. This means that assessment of science should include practical where learners would be demonstrating what they learnt.

There are different ways of assessing learners. These are performed deliberately with the intention of achieving particular outcomes as identified by both teachers and learners. In this section, the researcher looks at these various forms of assessing learners according to various researchers.

2.2.2 Traditional assessment

Drake and Anderson (2003) define traditional assessment as a term used to describe the means of gathering information on learner's learning through techniques such as multiple-choice, fill-in-the blanks and matching questions as well as essays. These approaches are particularly useful in assessing learners' knowledge of information, concepts and values. Traditionally, forms of assessing learners' knowledge neither prompt learners to reveal all they know about the subject, nor challenge them to learn

more. Drake and Nelson (1997) explains that these forms of assessing learners involve only recalling discrete information which is likely to encourage teaching methods that emphasize low-level cognition. For this study, the traditional assessment strategies will not work as the Ministry of Education aims on produce effective learners at the end of schooling who can contribute towards the economy of the country (Ministry of Education, 2008), therefore traditional assessment have limitations in terms of reaching standards of education needed by the Ministry of Education

2.2.2 Limitations of traditional assessment

Traditional assessment has limitations that led to the shift to the use of alternative assessments which are now in use or important to monitor learners' learning. Drake and Nelson (1997) state that traditional methods of assessment fail to measure adequately what learners know and are able to do because learners are just recalling and choosing from alternatives given and filling some blank spaces with short answers. Hancock (1994) argues that traditional assessment is given at a particular point in time to sample learners learning. This means that it is given at the end of the lesson or quarter hence there is no catering for learners who experienced problems in the course of the lesson.

Anderson (2003) and Belle (1999) point out that traditional assessment has been viewed as the means of certification and accountability because information memorized for the assessment is never retained after the assessment or test. Bowers (1989) explains out that traditional assessment is curriculum-driven. As a result it does not provide in-depth assessment of knowledge and skills that indicate mastery of a given subject and learners are not constructing their own meanings.

Furthermore, Mueller (2006) argues against the curriculum-driven form or type of traditional assessment because the body of knowledge is determined first and that knowledge becomes the curriculum and assessment is developed to determine knowledge, which is assessment done to cover or meet the requirements of the curriculum. Traditional assessment is often norm-referenced; this denotes that the scores that learners obtained are placed along a normal distribution from all learners who have taken the same test. Lambert and Lines (2000) define norm-referenced assessment as a

system of assessment that judges the individual performance within a group's performance that is how one has performed in comparison with others.

Anderson (2003) argues that traditional assessment treats learning as a passive process and the metaphor of empty vessel is often used to talk about learners. This means that learners are treated as if they do not possess knowledge before introduced to any from the knower (teacher). Teacher's role here is taken as filling the empty vessels (learners) by giving knowledge or information which the instructor considers to constitutes the true knowledge.

Moreover, traditional assessment is viewed by Muirhead (2002) and Anderson (2003) as a model that separates learners who know from the learners who do not know because it creates system that classifies and ranks learners. They further argue that in traditional assessment the teacher is the only one who has power to make decisions on what is to be learned and how it should be learned. The teacher is also the only one who determines whether learners can participate or not in their own assessment.

Anderson (2003) and Bray (1986) concurs with Drake (1997) and explain that traditional assessment encourages low-level cognition because they involve only recall of discrete information that is it prompts learners to reveal all they know about a subject and fail to assess the higher order thinking skill, application and synthesis. Atlas (2006) argues that traditional assessments place learners in a passive role rather encouraging learners to produce ideas and solve problems.

Getting to know a pupil as learners is essential but difficult and sometimes a painfully slow process. These are also evidently difficult processes to get right and integrate into teaching. Drake and Nelson (1997) argue that traditional methods of assessment such as multiple choice questions and matching exercise fail to measure adequately what learners know and are to do in different disciplines. They further argue that as a result of this failure, traditional modes of assessments must be complemented by new methods of assessment to improve the quality of what the learners learn.

According to Joffe (1993) the main criticism of the traditional assessment is that it is limited, in what is assessed, the means of assessment and the teachers understanding of

assessment. She further indicates that traditional assessments often do not tell us what we want to know about our learners. So the learner must be complemented by the new methods that can strengthen and improve the teaching and learning in the school and these are alternative assessment. Wiggins (1994) and Atlas (2006) argue that these alternative assessments are so-called because they are alternative to traditional assessment as they provide more direct evidence of meaningful application of knowledge and skills.

2.2.3 Alternative assessment

Ministry of Education (2008) indicates that at the end of the learning progress learners should be able to show meaningful knowledge, skill and attitude in order to compete in the world of economy. This implies that alternative assessment strategies will be suitable for this study. Lambert and Lines (2000) explains that skills are unlikely to be assimilated readily, particularly if teaching is conceptualized as a matter of covering the curriculum ensuring that learners are exposed to a body of knowledge or contents of a particularly test.

Law and Eckes (1995) mention that there are alternatives to this traditional way of assessing that are advocated to focus on how to engage learners actively in the learning process. Hancock (1994) defines it as an on-going strategy through which learners' learning is not only monitored but also involved in making decisions about the degree to which their performance matches their ability. Drake (1997) argues that alternative assessment can be used as a diagnostic tool to improve both a teacher's instruction and a learner's learning by revealing information about different dimensions. He further argues that learners who complete alternative assessment activities demonstrate their knowledge of facts, themes and ideas as a result alternative assessment have advantages towards educational system required by the Ministry of Education.

2.2.3.1 Advantages of alternative assessment

Drake (1997) explains that knowledge is the prerequisite that learners need to demonstrate their ability in other dimensions. He further indicates that themes serve as filters to help learners differentiate between what is important and significant because

they provide direction for learners to accurately identify, define and describe important concepts and facts.

Furthermore, Muirhead (2002) explains that learners who complete alternative assessment activities demonstrate their ability to reason that is, to analyse, evaluate and synthesize because they are not used to old methods of assessment of recalling information only. Marsh (1997) suggests that alternative assessment will involve teachers in the assessment process and link it directly with learning outcomes. The outcome of the above assessment strategies will be dependent on stakeholders who have an interest and involvement in the successful performance of the learner. This means learners will be able to demonstrate their ability, to demonstrate their knowledge and to apply scientific skills in the world outside the classroom.

Another important aspect of alternative assessment that maybe considered is interaction of the teacher and learners during assessment of Integrated Form Three Science. Stears and Gopal (2010, p. 595 indicate

Interactive assessment involves the teacher noticing, recognising and responding. It may be implemented when no specific assessment activity is planned. This type of assessment hinges on learner-teacher interactions and allows assessment of a wider range of learning outcomes than specific science outcomes. It allows the teacher to gain ephemeral information that is of a verbal nature (comments and questions) and non-verbal (body language) interactions with others.

This implies that teachers need to know what they are assessing in terms of the learning outcomes which is, what the learner will demonstrate at the end of the learning process or could be seen or heard during the learning process as the teacher communicate or ask question to the learners. Alternative assessments may include the following different types of assessment: baseline, continuous and ipsative assessment.

Baseline assessment is defined by the Ministry of Education (2008) as an assessment that is given at the beginning of the grade or learning experience to check what learners already know. It is important as it directs the teacher with the planning of the learning programme and learning activities.

Continuous assessment is the developmental and interactive type of assessment as it informs teachers and learners about the learning progress and the teacher may use thought-provoking questions to stimulate learner thinking and discussion (Malan, 1997).

This implies that this assessment is carried out during the learning towards the outcomes.

Ipsative assessment is defined by Malan as a form of assessment that is meant to judge learner's performance against the previous performance. He further indicates that the results of the learner can be reported quantitatively or qualitatively and can be used for promotion, screening or formative purposes. This means the judgment is tailored to an individual's achievement.

Lubisi (1999) argues that these assessments are tools used by teachers to get information about learning and teaching. Teacher must extend knowledge and skills for reflecting critically on assessment matters as there is a shift from traditional ways of assessment to alternative ways which are always connected to the clearly stated outcomes. In this context assessment is in line with learners' performance towards acquiring knowledge, skills and attitudes on stated outcomes.

2.2.4 Traditional assessment versus Alternative assessment

Bailey (1998) indicates that traditional assessments are indirect and authentic. She further shows that traditional assessments are standardized. This means this assessment is one shot, speed-based and norm-referenced. On the other hand, alternative assessments assess higher order thinking skills. Learners have chance to demonstrate what they have learnt (Law and Eckes 1995). That is learners who fail to show their knowledge or what they have learnt at a particular time are given another chance to demonstrate their ability.

Moreover, Law and Eckes (1995) indicate that traditional assessment are single occasion concentrating on how much learners can memorize with no feedback given to learners. On the contrary (Brualdi, 1996) sees alternative assessment as a way of looking at learners growth and performance in the classroom, also this assessment is developed in context and over time therefore the teacher has chance to measure the strength and weakness of learners in various ways (Law and Eckes 1995). For this study the focus is on alternative assessment as in the teaching and learning of Science learners contribute towards achieving the learning outcomes.

2.2.5 Criterion-referenced assessment versus Norm-referenced assessment

Norm-referenced tests are designed to examine individual performance in relation to the performance of a representative group. Criterion-referenced tests document individual performance in relation to a domain of information or specific set of skills (Swezey, 1981). Swezey further indicates that criterion-referenced tests are related directly to instructional objectives, are based on task analysis, and are designed to measure changes in successive performances of an individual. Criterion-referenced tests, therefore, are sensitive to and can be used to measure the effects of instruction. In addition Huitt (1996) indicates that the purpose of criterion-referenced assessment is to determine whether each student has achieved specific skills or concepts, and to find out how much students know before instruction begins and after it has finished while norm-referenced assessment is used to rank each student with respect to the achievement of others in broad areas of knowledge and also to discriminate between high and low achievers. The next section outlines the outcomes in the teaching and learning of Form Three Integrated Science.

2.3 Validity

Malan (1997) states that the learners must be very clear on the purpose of the assessment tasks if the validity of the assessment is to be beyond question. Atlas (2006) defines validity as the extent to which an assessment procedure measures what it is intended to measure. Any task which claims to assess a learner's conceptual understanding, but requires memorized answers will be valid (Malan, 1997). In contextual assessment it is important for the person who assesses to know the learners well in order to make a better judgment.

According to Cowie and Bell (1999) if the teachers do not know the learners those teachers will not be able to assess the kinds of outcomes described. Contextual assessment strategies can only be valid if the assessor knows the learners well and this is the only way of considering such judgment to be trustworthy. Dunn (2006) states that results from assessment activity should be evaluated to address their reliability, validity, and utility. Dunn further indicates that poor student performance can reflect limited learning or an ill-designed assessment process. This means that examining how

effectively the assessment strategy meets departmental needs is a critical step in the evolution of the department plan

2.4 Reliability

Malan (1997) states that in the test or assessment task should produce the same results every time it is used to assess learners' work. Irrespective of whom the assessors are or where/when the assessment is taking place. Malan continues and shows that the outcomes of the assessment procedure should indicate that the same thing was assessed amongst the learners using the same assessment tool. This implies that the reliability of an assessment procedure is evident in how consistently the procedure produces the same information. The above mention aspects of assessments could be shown in any assessment task that will be given to check if outcomes have been achieved or not.

2.5 Outcomes

The outcomes in education are said to be very important in the way that they are broad and cross-curricular. They ensure that in the learning process, learners are getting opportunity to gain the skills, knowledge and values that will help them to cope and contribute to their own success, their families well being, their community and national wide. Outcomes are clear statements of the knowledge, skills and understanding expected to be achieved by most learners by the end of a given stage of teaching and learning (Ministry of Education, 2008). They further indicate that outcomes provide signposts of learners' progress and they provide a basic for summative reporting. This means values and attitudes of learners will be considered as they demonstrate confidence of ability and willingness and implement decisions when dealing with scientific concepts (Stears & Gopal, 2010). According to IRP (1996) outcomes are targeting at developing learners towards personal development, implementing of their knowledge and competing in the world of economy. Therefore outcomes aim at displaying of what is learnt after the learning process.

2.5.1 Outcomes of Form Three Integrated Science

NCDC provides package of basic information that teachers requires in order to implement Integrated Science in Form Three (Ministry of Education, 2008). They further indicate that the package includes: subject syllabus, teachers' guided books, and learners' text books. It is in the curriculum where the outcomes are written, then the syllabus have subject outcomes and in this context Integrated Science Outcomes. On the same note Integrated Resource Package (1996) which will later be referred to IRP indicates that in Columbia they provide prescribed curriculum for Science Eight to ten which is structured according to their curriculum organisation. Every country in the world has its own curriculum that is based on the needs of their society so the outcomes are in line with the society needs.

2.5.2 Broad outcomes

According the Ministry of Education (2008), broad outcomes indicate the capabilities which learners acquire as they go through the education system at different levels. They also indicate the learners' ability to apply knowledge and acquired skills and to demonstrate values and attitudes which are necessary to address current and new situations. In addition, Mioduser, Richard and Gong (1998) indicate that broad outcomes refer to operational target and priority strategies in education system. They continue to show that these broad outcomes identified by the framework are: Effective and functional communication, Problem solving, Scientific, technological and creative skills, Critical thinking, Collaboration and co-operation, Functional numeracy and Learning to learn. IRP (1999, p.5) indicates

broad outcomes statement are written to enable the teacher to use their experience and professional judgment when planning and evaluating. The broad outcomes are benchmarks that will permit the use of various assessment strategies in the teaching and learning of Science.

This implies that broad outcomes assist teachers in identifying learners' achievement and in planning future learning experiences. IRP further indicates that broad outcomes assist teachers in identifying learners' current achievement and in planning future learning experiences. They further indicate that broad outcomes show not only development across stage, but different ways in which learners might demonstrate

progress in terms of the content strands. According to the Ministry of Education (2008), these operational targets are meant to promoting scientific and technological skills in responding to socio-economic challenges and to apply acquired knowledge, skills and attitudes necessary for effective participation in democratic processes and social activities.

2.5.3 Subject outcomes

According to Rice (1996) the Learning Outcomes describing what knowledge, skills, and attitudes learners are expected to demonstrate as a result of their cumulative learning experiences from Grade Primary to graduation. Stear and Gopal (2010) indicate that the subject outcomes transform the broad outcomes into specific outcomes. They should be aligned in such a way that all subject outcomes are targeting the same broad outcome. This means with some of the most general and broadest outcome statements prescribed for the same level, we can transform them to specific levels thereafter, and subsequently transform them to learning outcome of particular subject and in this context we are looking at Form Three Integrated Science.

2.3.5 Learning outcomes

The achievement of learners rather than the intensions of the teacher normally expressed in aims of the subject are considered as learning outcomes Pfaffenberger, (2002). This implies that outcomes statements can be written at different levels. As has been mentioned previously, outcome statements should be broad statements, though it can be even broader at the discipline level. Gosling (2001, p. 5), agree with Pfaffenberger and consider learning outcomes as “statements of what learner is expected to know, understand and/or be able to demonstrate”. For instance, with some of the most general and broadest outcome statements prescribed for the discipline level, we can transform them to specific subject outcomes thereafter, and subsequently transform them to learning outcomes.

Furthermore, Ministry of Education (2008) considers learning outcomes as statement of body of knowledge that learners are expected to acquire and demonstrate at the end of teaching and learning progress. IRP (1996, p.5), prompts that learning outcomes are

statements that prescribe knowledge, enduring ideas, issues, concepts, skills and attitude for Integrated Science. They are statements of what learners are expected to know and to be able to do in each grade. Learning outcomes are clearly stated and expressed in observable and measurable terms.

This shows that learning outcomes which are derived from subject outcomes should be clearly stated towards what is expected from the learner that is they must be measurable and observable.

According to Joffe (1993) in the Developed countries experienced teachers who use a wide range of the teaching techniques in the classroom, assessment strategies are supported by adequate in-service which works towards improving teachers understanding of assessment by teachers. In the light of what has been said in the literature about outcomes, although the Ministry of Education is making broad outcomes to welcome every learner at the end of secondary education there is still much to be done to ensure that teachers' understand outcomes and use them towards attaining favourable results at the end of schooling in order to be welcomed in the world of economy.

Do teachers understand what their learners are expected to achieve at various at the end of Junior Integrated Science? Kivulu (2006) indicates that each country need to clear standards alongside which the performance of our learners can be assessed. He further asks, if the public, especially the curriculum developers (subject specialist) can claim to have a thorough understanding in this context Science specialist. Malcom (1999) states that teacher's find the curriculum outcomes and assessment policy difficult, because there is lack clear guidance and little understanding and these causes confusion and possibly lower the standard of education. On the other hand, Chisholm (2002) argues that there is lack of alignment between outcomes and assessment strategies as well as clarity regarding assessment strategies and practice. All these indicate that learning outcomes focus on what the learners will be able to do at the end of the learning experience and in different learning areas specific outcomes describe what learners will be able to do on all levels of learning. Different learning outcomes are important and have advantages for both the teacher and the learner.

2.3.5.1 Advantages of learning outcomes

There is a great support internationally on clearly stated learning outcomes, for example learning outcomes: Help teachers to tell learners more precisely what is expected of them. Again they help learners to learn more effectively: learners know where they stand and the curriculum is made more open to them (Jenkins & Unwin 2001). Khattru, Kane, and Reeve, (1995) agreed that learning outcomes dramatically increases “*formative evaluation*” of student learning; that is clues as to how and why they reached their answers. Identifies and decreases error variance due to guessing. It also provides process evaluation of student thinking and speaking skills, along with knowledge content.

Furthermore Jenkins and Unwin (2001) indicate that learning outcomes help teachers to design their materials more effectively by acting as a template for them. Khattru, Kane, and Reeve, (1995) indicates that learning outcomes plays important role in the teaching and learning as they help teachers select the appropriate teaching strategy matched to the intended learning outcome, e.g. lecture, seminar, group work, tutorial, discussion, peer group presentation or laboratory class. This implies that clearly stated outcomes will assist teachers in the setting of examinations based on the materials delivered. These are important for both teachers and learners hence a well iterative learning environment.

2.6 Outcomes and assessment strategies of Form Three Integrated Science

According to the Ministry of Education (2008), the integrated Science curriculum assures continuity of knowledge construction and acquisition of appropriate skills and values from the core subjects in order for learners to have the best base of each discipline and to make good choice for their senior level. In addition IRP (2006) indicates that Applications of Science framework to weave the skills, processes, and attitudes of science throughout the three content organizers of Life Science, Physical Science, and Earth and Space Science. Fensham (2004) suggests that there are outcomes that learners may achieve in Integrated Science classrooms that are as important and, in fact, necessary, to achieve science knowledge outcomes in the longer term. This means

that learning of Integrated Science focus on three disciplines as learners will be introduced to discipline base in their senior secondary learning.

Teachers must understand how the knowledge and skills are organized in Science when they design their assessment tasks (Ministry of Education, 2006). The learning outcomes and assessment strategies in Integrated Science have been selected in way that Lesotho learners are considered as the future participants in the building up of the country's economy. Cognitive, skills and values are organized in a clear manner so that they could be easily understood. Teacher must understand that the teaching and learning of Integrated Science is to equip learners with skill and knowledge to participate in and contribute to their country. In the society that we are living in, that is democratic and changing teachers' assessment should be relevant and to stated learning outcomes and where possible allow learners to practice with the aim of developing through the experience, acquiring knowledge skills and values.

According to the Ministry of Education and Manapower, (2002) teachers must understand assessment standards wording often gives an indication of the most appropriate form of assessment to be used to gather evidence of learning performance. They further indicate that Form Three Assessment Standard on the statement below could be investigated and/or project:

“Investigates and compare the time covered by two objects of sizes 3 grams and 1 gram over a distance of 90 centimeters.”

- Making models of different size using clay
- Use the models to find out the time that would be covered by each model
- Find the reasons why the time is the same or not the same.

This implies that learning outcomes and their associated assessment strategies in Integrated Science should be interrelated in order to lead to skillful and understanding learners. The wanted and unwanted results of assessment need to be examined with appropriate evidence that supports particular arguments or points of view. This indicates that all evidence gathered from activities and tasks must relate to the learning outcomes specified.

Khoza's (2001) study on the outcomes of a computer literacy course which was offered by UniSchool revealed the importance of linking lesson outcomes to lesson activities or assessment strategies. He found that about forty percent of the learners failed computer literacy course because other outcomes were not observable or measurable to guide the facilitators on how to measure their learners' performance. From his study one may conclude that clearly stated outcomes, that is observable and measurable. Assessment strategies should also be linked to outcomes.

On the same note, Uys and Alant (2004), suggests that outcomes are observable and measurable if they have clear and concise written statements of intension that is being behavioral. Stears & Gopal, (2010) in their study indicate that learners' performance is poor on pen and paper test and this could be connected to failure to state measurable learning outcomes. They further indicate that assessment made during the activity may help reinforce learning and provide a point of reference for the learner's progress towards favourable outcomes. This implies that if outcomes are not well stated they could mislead the used of assessment strategies.

Reeves, Herrington and Oliver (2004), indicate that diversity outcomes should be promoted and be integrated with assessment activities in order to have real-world relevance for learners. Criticos, Long, Moletsane and Mthiyane (2005) indicate that assessment help to develop new concepts extend existing concepts hence achievement of broad outcomes. This suggests that outcomes and assessment activities should link learners to the development of scientific skills and critical thinking at the end of Form Three. According to Ramsden (2003), teachers are faced with the challenge of aligning learning or/ and teaching methods, assessment strategies and learning outcomes. Ramsden further indicates that the connection of these three helps to make the overall learning experience more transparent, that is a balance between teaching strategies on one side and learning outcomes and assessment on the other side. In this way there would be clarity in identifying learning outcomes loop holes and poor performance of learners. In this study considering assessment task as mirror of the learning outcomes would help to improve learning of Form Three Integrated Science.

2.7 Objectives

Jenkins and Unwin (2001) defined objectives as specific statements of teaching intentions that is; it indicates specific areas that teachers intend to cover in a block of learning. Objectives are not measurable for example they can be stated as: at the end of the lesson learners should understand, at the end of the lesson learners would be introduced to etc. The statements can further be broken into learning outcomes because they incorporate different aspects within them. Gosling and Moon (2001) indicated that learners can show their understanding by: comparing and contrasting, by defining, by constructing or even by demonstrating. This clearly indicates how broad objectives can be in the learning of Integrated Science.

Gosling and Moon (2001) indicated that one of the problems with objectives is that: objectives are sometimes confused with learning outcomes. They further revealed that objectives belong to the teacher centered approach therefore cater less for the learners. Furthermore Gosling and Moon indicated that objectives are not clearly stating what learners have to be competent with at the end of the learning period. This implies that objectives by the help of learning outcomes gives more specific information about what the teaching of the Integrated Science hopes to achieve. This is clearly shown in the Science Syllabus in Appendix G.

2.8 Chapter summary

This study is intending to find out more about experiences and practices of Form Three Integrated Science Teachers with regard to outcomes and assessment strategies. Again this chapter considers different areas of involvement of outcomes and assessment in the learning and teaching of Integrated Science. Literature does indicate the importance of clearly stated outcomes as this makes designing of assessment task easier. Teachers' experiences and practices of outcomes and assessment can help towards improving of the teaching and learning of Integrated Science in Lesotho Secondary Education.

Some of the issues relate to practices of learners while others relate to practices of the science teachers and others relating to assessment and outcomes. The important role that assessment can play in improving the teaching and learning of science if the learning

outcomes are clearly stated has been indicated by more than one author. There had been issues relating to teaching, learning and assessment in secondary science that have been study. From what the literature revealed, assessment and outcomes cannot be divorced from one another. Objectives were also addressed as they are sometimes confused with outcomes. The next chapter will discuss the paradigm and the theories of enquiry for which this study will be located in.

CHAPTER THREE

PARADIGM AND THEORIES OF INQUIRY

3.1 Introduction

The previous chapter addressed the issues around outcomes and assessment strategies as given by different scholars. This chapter will discuss the paradigm and theories of inquiry within which the study is located. The first part outlines the paradigm and approach which inform the study. The second part outlines the two theories which inform the study.

3.2 Research paradigm

According to Opie (2004, p. 18) paradigm is “*a basic set of beliefs that guides action*”, and suggests that historically two main paradigms have influenced educational research, the qualitative and quantitative research paradigms. Denzin and Lincoln (2000, p. 157) describe a paradigm as a basic set of beliefs that guide the action and comprises, ethics, epistemology, ontology and methodology as described in chapter three. This study is framed by interpretive paradigm, as it is grounded in the world of lived experiences.

3.2.1 Interpretive Paradigm

Neuman (2006, p. 81) defines a research paradigm as “A general organising framework for theory and research that includes basic assumptions, key issues, models of quality research, and methods for seeking answers.” This paradigm allows a researcher to study people’s beliefs, values, meaning making, experiences, attitudes and self-understanding (Cohen, Manion, & Morrison, 2007; Henning, Van Rensburg, & Smit, 2007). According to Cresswell (2008) interpretive research concentrates on development of in-depth analysis of a single or multiple cases. It allows a thoroughly understanding of teachers’ experience and practices.

This is an interpretive study which will be conducted within a qualitative approach. Although interpretive paradigm consider both quantitative and qualitative techniques, it favours qualitative methods of data collection and analysis than quantitative as qualitative gives rich and in-depth description of a phenomenon (Henning et al, 2005).

The researchers who subscribe to the quantitative research paradigm believe in quality and mostly answers the question “how many?” (Bertram, 2004). She further indicates that qualitative research is used when breadth is required and when the researcher wants to get the connection. Henning et al (2005) think interpretive approach is qualitative in nature because it allows making sense of the world through interaction. Nieuwenhuis (2010) consider interpretive qualitative approach as a way of understanding human life from within that is focuses on people’s subjective experiences, on how people “construct” the social world by sharing meanings, and how they interact with or relate with others. In order to address the critical questions of this study the researcher will interact with Form Three Integrated Science teachers in order to get a deeper understanding their subjective world of outcomes and assessment experience.

Wellington et al (2005) think it is necessary for interpretive researcher to collect necessary in-depth data in the natural world of human experiences. Nieuwenhuis (2010), correspondingly maintain that, this approach, social life is a distinctively human product meaning that reality is not objectively determined but socially constructed. Placing people in their social contexts brings greater opportunity to understand their activities. This means that the researcher will gain an understanding of underlying reasons and motivations of teachers’ experiences and practices of Form Three Integrated Science with regard to outcomes and assessment strategies.

According to Cresswell (2008) qualitative research is an inquiry approach which plays important role in exploring and getting to the roots of the phenomenon. Agreeably, Neuman (2006) validates that for the researcher to learn more about the phenomenon, there must be questions for the participant in different forms, which are broad questions and general questions in forms of words or images to collect all the necessary information. For this study this suggests that the participants’ responses are the origin of the data with richness, depth and complexity of phenomena.

The purpose of educational research is to understand the inform of human behaviour (Cresswell, 2008) and it is also based on the fact that it is not based on one reality or truth, but rather a set of realities or truths which are historical, local, specific and non generalisable (Orenstein and Lasley 2004, Denzin and Lincoln, 2003 & Nieuwenhuis, 2010). Moreover, Nieuwenhuis (2010) indicates that the social world does not “exist”

independently of human knowledge. As researchers our knowledge and understanding of phenomena constantly influence us in terms of the types of questions we ask and in the way we can conduct our research.

Furthermore, Denzin and Lincoln (2003) indicates that paradigm recognises that the results are not 'out there' waiting to be found or discovered by the researcher instead they are created through the interpretation of data. Cresswell (2008) further indicate that interpretive paradigm is primarily directed towards understanding and gaining meaning of individual according to their interpretation. These means that human behaviour is affected by knowledge of the social world this relates to the fact that there are multiple realities of phenomena and these realities differ across time and place.

Furthermore, (Nieuwenhuis, 2010) indicates that in the interpretive paradigm, reality (ontology) is socially constructed and its knowledge (epistemology) is self objective, built from experience and interpretation or meaning which indicates that knowledge is constructed in the mind of individual. Cohen *et al* (2007) indicates that the essential thing of interpretive paradigm is to understand the subjective world of human experience. This is where research methodology seeks to clarify, understand and interpret the communication of speaking and acting subject. In this context the researcher wants to understand teachers understanding of outcomes and assessment strategies of Form Three Integrated Science. Figure 4.2 represent the representation of interpretive paradigm.

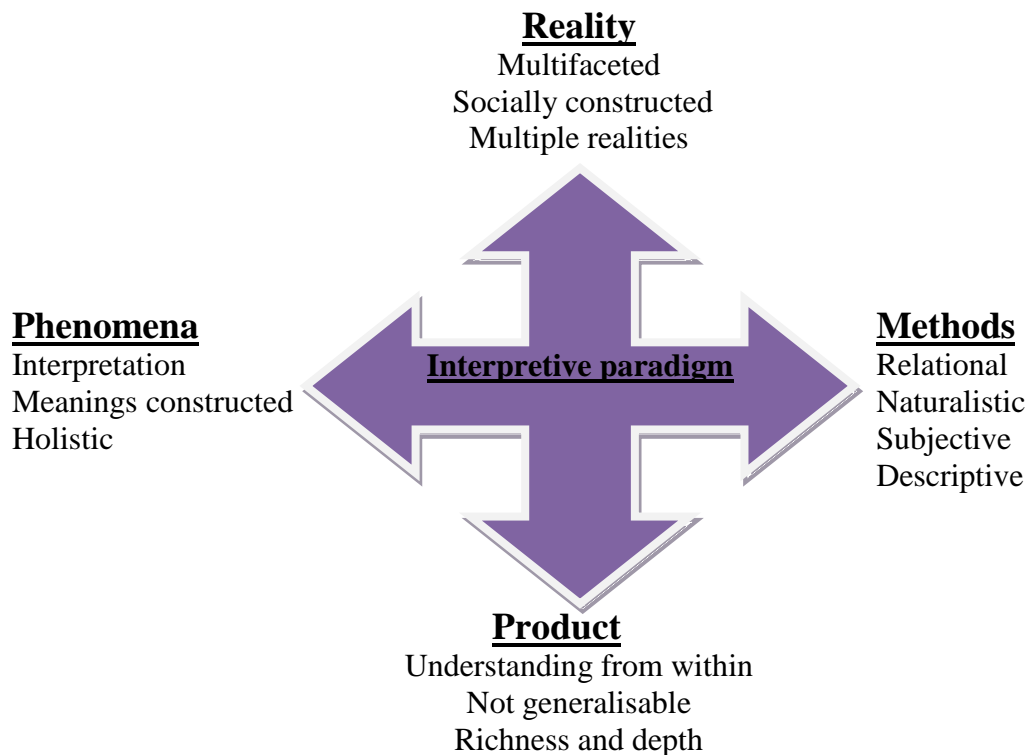


Figure 3.1 above illustrate the interpretive paradigm adapted from Nieuwenhuis, (2010).

3.3 Theoretical framework and conceptual frameworks

The framework is needed in a research project because it works towards why the project is done in a particular way (Sana, 2003). Likewise, Henning (2004) indicates that framework helps the researcher to theorise his/her study. In a study there can be a theoretical or conceptual framework or both to structure the study. Theoretical framework is defined “as a well developed coherent explanation of events” (Vithal and Jansen, 1997, p.17). On the other hand conceptual framework is a sort of empirical inquiry that can take different forums based on the research questions or problem (Sana, 2003). In this study, both theoretical and conceptual framework will be considered.

This study is underpinned by two theories namely: social constructionist theory and Bloom’s Taxonomies. Social constructionist underpins social practices and practitioners views on them on the other side Bloom’s taxonomy provides details of construction of assessment tools towards attaining outcomes at the end of the learning period. This study rest on the theories mentioned above because outcomes in the learning process are

monitored by assessment which is always a cornerstone for every quality achievement towards stated objectives.

3.3.1 Social constructionist theory

The social constructionist theory focuses on how the society constructs the environment they live in (Burr, 2003). The basic tenets of this theory comprise of focus on the collective than individual construction (Young & Collin, 2004); it is shaped by “intentional human agents...is independent of human mental activity and human symbolic language” (Schwandt, 1994, p.125); views language as an important player in social construction; and it also is about “how the world comes to be endowed with meaning, and how those meanings are reproduced, negotiated and transformed through social practice” (Cohen *et al*, 2004, p.41).

Furthermore, Kim (2001) cites Derry and McMahon points out that social constructionist emphasizes the importance of culture and context in understanding what occurs in society and constructing knowledge based on this understanding. He further indicates that social constructionist theory deals with anything that exists by virtue of social interactions. This indicates that teaching and learning of Integrated Science are hindered or facilitated by teacher and learner factors such as learners’ backgrounds, teachers’ attitudes and interpretation of curriculum documents, expectations of the society and demands of public.

According to Kim (2001) there are a number of assumptions in social constructionist namely: reality, knowledge and learning. Likewise, Burr, (2003) contends that reality, artifacts and social construction are assumptions in social constructionist which are not actually objective about the world but independent of human subjective. This suggest that in the teaching and learning of Integrated Science in Form Three these assumptions will work together towards the underlying experiences and practices of teachers with regard to outcomes and assessment strategies.

Each assumption given by Kim (2001, p. 3) is explained as given below:

Reality: Kukla, cited in Kim (2001) illustrates that social constructivists believe that reality is constructed through human activity. Members of a society together invent the properties of the world. For the social constructivist, reality cannot be discovered: it does not exist prior to its social invention. Likewise, Young and Collin (2004) claim that social constructionists' belief that social reality is the "universe" of socially constructed knowledge created by virtue of social interactions. They further indicate that social reality is based in our behaviour, our language, our culture and our practices all of our perception.

Knowledge/Artifacts: To social constructivists, knowledge is also a human product, and is socially and culturally constructed (Ernest, Gredler, Prat & Floden, cited in Kim 2001). Individuals create meaning through their interactions with each other and with the environment they live in. This could be more or less applying to artifacts which are defined by Young and Collin (2004) as knowledge gained socially and culturally upon the background of the social reality.

Learning: Social constructivists view learning as a social process. It does not take place only within an individual, nor is it a passive development of behaviors that are shaped by external forces (McMahon, 1997). Meaningful learning occurs when individuals are engaged in social activities. The above mentions assumption suggest that social constructivists find both the context in which learning takes place and the social contexts taken to learning environment by learners important in the teaching and learning.

3.3.2 Bloom's Taxonomies theory

Bloom's taxonomy is a theoretical framework that informs this study because the focus is on Form Three Integrated Science teachers' experiences of outcomes and assessment strategies and how they practice them in their classrooms. Henning (2004) demonstrates that in order to get to the root of the focus, that is understanding individual experiences and practice participants need their working and living environment in their unique context and background. This implies that, the fundamental assumption is to understand their experiences and practices; teachers will give rich information based on the focus of the study.

The test items are derived and compiled from organised and clearly formulated teaching objectives (Fraser, Loubser and Van Rooy 1990). One of the most famous schemes of classification of levels of handling information is that which was developed by Bloom, Krathwohl and Masia (1956) and later simplified by Bloom, Madaus and Hastings (1981). They further indicate that in the process of teaching and learning, learners are trained to handle and work with information to different levels of complexity. This indicates different levels of Bloom's taxonomy give a qualitative description of what the learner is expected to show/demonstrate following instructions or during assessment.

In locating the position of assessment in the teaching and learning of Integrated Science Ministry of Education (2008) show that assessment completes the learning cycle in that it evaluates the work of learners, educators and institutions while at same time it explicates and demonstrate learning targets. In this study this cycle includes observable and measurable learning outcomes which are assessed. So learning taxonomy of education by Bloom may give a way forward when outcomes and assessment strategies are related.

In this study Bloom's Taxonomy had been used as the frames of enquiry (theory) for analysing the outcomes and assessment strategies. Bloom's taxonomy provides details of construction of assessment which relates to the stated learning outcomes at the beginning of the lesson therefore it had been considered as an analytical framework. There are three important components that need to be considered in terms of using Bloom's Taxonomies, namely Cognitive, Skills and Attitude. Each one of these components is divided into sub-components (Ministry of Education, 2008).

Forehand (2005) outlined the sub-components of each domain as follows: cognitive components have remembering / knowledge, understanding / comprehension, applying, analysing, synthesising and evaluating / creating. Skills component has imitation, manipulation, precision, articulation and naturalisation. Attitude / values component has receiving, responding, valuing, organising with conceptualising and characterising by value or value concepts. This suggests that Bloom's taxonomies will be used because they are useful in generating assessment strategies to match with learning outcomes at

the end of the learning period or during the learning period. Table 3.1 below gives a summary of these levels in their order of increasing complexity, starting with the lowest. The right hand column of the table gives an example of what is expected of the learner in an objective or test item at the level.

Table 3.1 Summary of levels of Blooms taxonomy of classification of instructional objectives, adapted from Forehand (2005, p27)

Domain	Sub-component	What is expected of the learner
<i>Recognise and recall</i>	Knowledge	Recite or quote.
	Comprehension	Rewrites, explain or translate
	Applying	Apply knowledge in a new situation
	Analysing	Isolating crucial components of the knowledge
	Synthesising and evaluating	Recombining elements to yield new knowledge
	Evaluating	Applying higher order skills to test the worth of new knowledge
<i>Skill</i>	Imitation	Observing and patterning
	Manipulation	Follow instructions and practice
	Precision	Perform a task or activity and to demonstrate an activity to other learners
	Articulation	Coordinating
	Naturalisation	Having high level of performance
<i>Attitude / values</i>	Receiving	Listen and remember
	Responding	Create teams or new approaches
	Valuing	Demonstrate, justifies
	Organising with conceptualising	Generalise, relates
	Characterising	Qualifies, modifies

The levels of Bloom's taxonomy help the teacher towards developing learners in the learning and teaching of Integrated Science. At the same time it provides a guide on how to assess the attainment of the learning initially specified in the learning outcomes. The scheme will therefore be used as a framework for classifying each of the items in the assessment. This means that items are going to be classified according to their domains and sub-components levels.

3.3 Chapter summary

This study is intended to explore teachers' experiences with regard to outcomes and assessment strategies and to find out more about their practices in their Integrated Science classrooms. This chapter therefore highlighted the paradigm that would be used in the study and the theories informing the study; the position of assessment in the teaching and learning of Integrated Science in Lesotho and theories explaining people's disposition on their practices. The next chapter will address the research design and methodology

CHAPTER FOUR

RESEARCH DESIGN AND METHODOLOGY

4.1 Introduction

The previous chapter addressed the paradigm and theories of inquiry used in this study. And this chapter provides details of what approaches and data-gathering techniques would be used in the study to answer the research questions and justification for why certain methods and instruments were used. That is the philosophical and epistemological position of the study and also demonstrates how they connect to the research paradigm through which the inquiry is approached. These include appropriateness and limitations will be described. The sampling method used will be described and justify the use of the research instruments selected and discuss the issues of reliability, validity, and trustworthiness of the data gathered and the analysis thereof. Ethical issues and limitations of methodology will be demonstrated finally.

4.2 Research design and methodology

According to Nieuwenhuis (2010) the word design means a plan of how the researcher wants to carry out the research. Merriam (1998) reveals that this plan assessable, organizes, and integrates information and it result in a certain end product. This plan needs to be logically structured with inquiry that is aimed to answering the research question. The research design and methodology are different as given by Neiuwenhuis (2010) who asserts that the research design concentrates on the end product while the research methodology looks at research process and the kind of instrument and methods to be used in a research.

Henning *et al* (2007) asserts that methodology is the epistemological home of an inquiry that is the protocols that will be used to bring the research design to function. Methodology looks at different points like description of the source, methods and instruments; it is concentrating on the importance of using such sources. Silverman (2001) consider methodology as a way of meeting the focus of the study, that is the methods of data production, forms of data analysis necessary and finally the planning and conducting of the research. This means the way about studying of teachers'

experiences and practice of Form Three Integrated in regard to outcomes and assessment strategies.

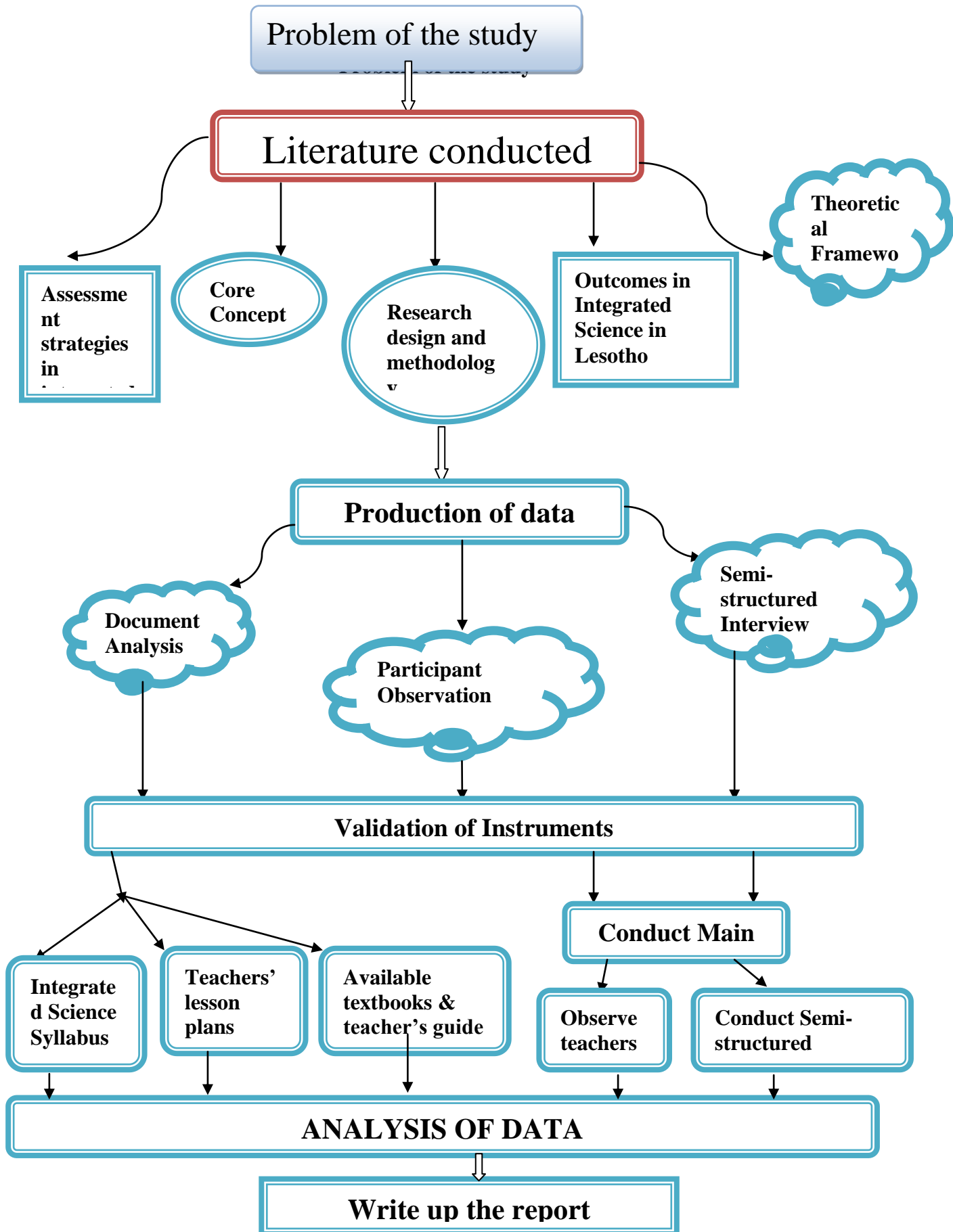
Furthermore, Henning *et al* (2007) defines research methodology as the methods that are working together and that have goodness of the fit to deliver data and findings that will reflect the research question and used fruitfully for the purpose of the research. It concentrates on the question why certain methods have been chosen and used. Research designs link data collection and analysis activities to the research questions and ensure that all research aspects will be addressed (Opie, 2004). This author claim that the honesty of the research, and its usefulness rests with the design implemented. The research design used for this study is outlined in figure 4.3 on page 52

4.3 Paradigm

Studies are conducted in different paradigms depending on the purpose. This means epistemology, ontology and methodology are directed by different paradigms. Kitzinger (1999) indicates that positivist researcher's work on only one truth and from their ontology the world is known (epistemology). On the other hand Wellington, Bathmaker, Hunt, McCulloch, and Sikes (2005) sees positivist researcher observing and accounted for through 'objective' quantifiable data. In addition Guba and Lincoln (1994) shows that researchers are also to describe control and predict how the world works.

Falconer and Mackay (1999) indicate that critical paradigm researcher sees ontology being based on many realities (realities based on power or politics and that they can change the world (epistemology). Guba and Lincoln (1994) indicate that positivist make use of experimental method which uses pre and post test. Cohen *et al* (2007) looked at critical paradigm as a way of bring change the researcher need to participate, that is participants become researchers. However this study is framed by interpretive paradigm.

The research design used for this study is outlined in Figure 4.3 below.



The study is based on how individual (teachers) make meaning of their world through interaction and this occurs in interpretive approach. According to Henning *et al* (2007) interpretive approach is qualitative in nature and qualitative technique will be suitable for this research because it will give the researcher a chance to investigate and get insight into teachers understanding of outcomes and assessment strategies in Form Three Integrated Science. The researcher also finds out why teachers teach or facilitate the learning of Integrated Science in the way they did and how many teachers think in the same way. Qualitative research also allowed the researcher to understand teachers' perceptions of outcomes and assessment strategies and how they make use of them in their teaching and learning environment.

Researchers involved in qualitative research, believe that individuals consciously construct their own understanding of the world through experience. This study is framed within the interpretive paradigm because the study is focusing on how teachers make sense of their teaching which is a reality and this will also allow in-depth understanding of their experiences. Interpretive paradigm will be the most suitable paradigm because the research is seeking the reality on the teachers understanding of Form Three Integrated Science in Leribe. This implies that teachers' experience, their interpretations and the researcher's interpretation will be the source of knowledge to be developed.

According to Stainback and Stainback (1988) the purpose of qualitative research is not to substantiate whether people's perceptions are true rather to ensure that the research findings truthfully reflect people's perceptions, whatever they may be. They further indicate that the purpose of qualitative research is to help researchers increase their understanding of the probability that their findings will be seen as credible or worthy of consideration by others. That is, ongoing interaction allows the researcher to understand more about teachers' experiences and how they practice outcomes and assessment in their Integrated Science classrooms.

Furthermore, Cresswell (2008) indicates that qualitative research is an inquiry approach which is useful in investigating and understanding a central phenomenon. He continues and indicates that the researcher learn about the phenomenon, the researcher asks participants broad and general questions, collects the detailed views of the participants in the form of words or images and then analyses the information in themes and

principles. In addition Leedy (1997) sees qualitative research as an “*inquiry process of understanding a social or human problem, based on building a complex, holistic picture, formed with words...*” (Leedy, 1997, p.105). Qualitative researchers tend to start their work by asking general questions, then collecting large amounts of data and usually presenting their findings in words (Leedy, 1997). Agreeably Neunam (2006) indicates that in order to understand the subjective world of human experiences, a qualitative technique in the interpretive paradigm could be used as the qualitative technique offers rich and thick description of a phenomenon, situation and activity. In this context the activity is teaching and learning, situated in Form Three Integrated Science and the phenomenon is the teachers’ understanding of outcomes and assessment strategies.

4.4 Case study

Cohen *et al* (2007) and Henning *et al* (2007) belief that case study is developed within qualitative research, they considered case study as a set of action and that it is distinguished from other types of qualitative research because they have intensive descriptions. According to Merriem (1998) the nature of research question informs the approach to be used. The research question in this study investigates teachers’ understanding of outcomes and assessment strategies in Form Three Integrated Science in Leribe. Henning *et al* (2007) indicates that case study is an in-depth study of one particular case, where the case may be person, a group of people, a school, a community or an organisation. In this study the case of teachers will be investigated to find the in-depth understanding of these teachers. That is to describe what is like to be teaching Form Three Integrated Science in Secondary schools in Leribe. According to Cohen *et al* (2007) the researcher aims to capture the reality of the participants’ lived experiences of and thoughts about a particular situation.

Moreover, Henning *et al* (2007) asserts that it focuses on the interaction between the context and action; this will help the researcher to probe deeply and analyse intensively the multifarious phenomenon (Cohen *et al* 2007). Cresswell (2008) considers case study to be single or be many cases that need a thorough analysis or an investigation. Other scholar like Eisenhart, (2006) argues that a case study examines a certain phenomenon

and this gives the researcher a chance to probe deeply and to analyse intensively the multifarious phenomenon.

Cohen *et al* (2007) note that a case study has a number of advantages which include, inter alia, potential to capture unique features of a phenomenon and the fact that it can be undertaken by a single researcher without the help of a team of researchers. Agreeably, Hayes' (2000) study indicates that cases studies are have advantages like stimulating a new research due to extra-ordinary experience the researcher come across and also that it can give insight into phenomenon because case studies are so rich in information. However, a case study results may not be generalized except where other readers or researchers see its applicability that is adopt it in a similar situation (Cohen *et al.*, 2007). In this regard, it is not the intention of this study to generalize the findings to all the schools in the country, but rather the aim is to get the deeper understanding of teachers' understanding of outcomes and assessment in Form Three Integrated Science in Lesotho but the finding could be adopted in situations similar.

In a case study the researcher strives to portray what is it likely to be in a particular situation. Henning *et al* (2007) indicate that in a case study the main assumption is that a phenomenon is investigated as a "bonded system". Mainly case study is designed to gain in-depth understanding of the situation and meaning of those involved. The rationale is visible in the selection of the sample as given below:

4.5 The Sampling

Purposive sampling was used in this study. Purposive sampling is defined by Denzin & Lincoln (2003) as a selection of sample on basis of knowledge of the population, own knowledge or expert judges to identify suitable participants for the purpose of the study. In this research the participants would be teachers who are teaching Integrated Science in Form Three. Cohen *et al* (2007) explains that case study gives a unique example of real people in real life situation while Merriam (1998) defines a case study as a way of examining specific phenomenon such as events, people or programme, in this case the study will investigate teachers in their real life of teaching Integrated Science.

4.6 Context of the school

Lesotho is landlocked country – entirely surrounded by South Africa. It is the only dependent state in the whole world that lies above the thousand (1,000) meters above the sea level. 1,400 meters is its lowest point and over 80% of the country lies above 1,800 meters. Leribe district is on 1,400 meters above the sea level. Figure 3.1 is the map of Lesotho and two schools are located by the arrows.

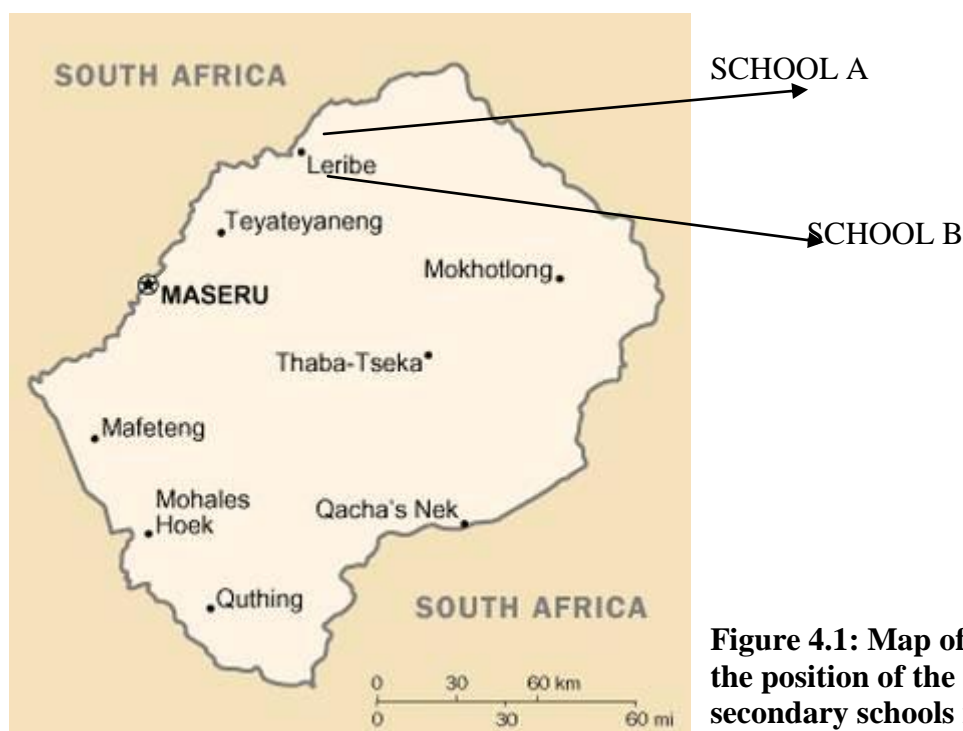


Figure 4.1: Map of Lesotho, the position of the two secondary schools in Leribe District.

Source: www.Places.co.za

The two secondary schools chosen are located in the Leribe District. School A is a Roman Catholic Church school and School B is an Evangelical Church school. The district mostly comprises rural areas in the form of villages and sub-urban with manufacturing factories. These schools are surrounded by communities of a working and non-working class that is some of the parents are employed in factories and some places that are far away and most makes living out of subsistence farming. Therefore the schools are both directly and indirectly affected, since the learner population consists of children from such families.

On the other hand, the two schools are well resourced in terms of: trained teachers, laboratories and chemicals. The government pays teachers' salaries and sometimes

helps the school with capital expenditure. However, the Government does not provide subvention fee to this school though it pays fees for orphaned and vulnerable children. Fees for other learners are paid by their parents. Vulnerable and orphaned children make about 40 % of the total number of learners. This does not necessarily suggest that all the schools have exactly the same set of problems but the situation may differ according to each particular school. The two schools use a functioning timetable and the learning and teaching is supported by the Ministry of Education.

A sample is expected to reflect the population from which it has been chosen from, but, it does not necessarily guarantee that the sample will be precisely representative of the population from which it comes (Cohen *et al*, 2007). When dealing with people, a sample can be defined as a set of respondents selected from a larger population for the purpose of the study (Denzin & Lincoln, 2003). This implies that amongst all teachers only three Form Three Integrated Science teachers will participate in this study.

The time constraints may not allow for a long time observation even though the interest is on understanding which is a real phenomenon. Neither is the study concerned about how widespread the phenomenon is, so quantitative method was not applicable because there were few participants. It therefore needs a small sample which will allow for examination of the phenomenon from more than one angle. The study will therefore be subjective and interpretive in that it can bring out different perspectives of the phenomenon.

A small sample was selected precisely to investigate their understanding of outcomes and assessment strategies in Form Three Integrated Science in depth in two schools in Leribe. These two high schools are selected for this study because they will be easily accessible to the researcher for the purposes of negotiating access and collection of data within the parameters of time and money budget this implies that convenience sampling was also considered. Furthermore the participants were reached at anytime of data collection. The sample size is also determined to some extent by the style of the research (Cohen *et al*, 2007). They further indicate that in qualitative research it is more likely to get into depth when the sample is small.

The site sample was used because they are individuals at the site for research purpose and this involved Form Three Integrated Science Teachers. They provided sufficient data for a small scale study and give most advantageous light on their experiences and practice with regard to outcomes and assessment strategies of Form Three Integrated Science.

The participants who were teachers in these schools are males and females who are generally qualified for the teaching and learning of Science. These teachers had access to Integrated Science syllabus, Integrated Science teachers' guide, and Integrated Science text book for the learners and also have their daily lesson plans as recommended by the Ministry of Education (Ministry of Education, 2008). In that way, their access to these documents helped the researcher to collect data as stipulated below.

4.7 Production of data

This research entails a multi-method study. For the study to be corroboration, triangulation must be part of the research. Denzil and Lincoln (2003) had identified several types of triangulation namely: convergence of multiple data source, methodological triangulation which involves the convergence of data from multiple data collection sources and investigator triangulation in which multiple researchers are involved in an investigation. Any of these triangulation help to have cross-examination. In this research triangulations involves multiple data sources and methodological triangulation, data collection / production that the study anticipates using involved document analysis, participant observation and semi-structured interviews. The data produced from three sources had been converged.

All the data production was conducted in the schools' premises. The documents analysis was conducted in the office and then a participant observation were done in Form Three Integrated classrooms and Science Laboratories. The semi-structured interviews were taken in the office or laboratory or any place that would be convenient to avoid disturbance by other members of the staff. The school time table was highly considered as the semi-structured interviews were conducted when participant were having free periods.

4.7.1 Document Analysis

This method of data production helped the researcher to answer the first research question which is: What are the experiences of Form Three Integrated Science teachers with regards to outcomes and assessment strategies? The documents were analysed with an aim of identifying experiences and practices of Form Three Integrated Science teachers with regards to outcomes and assessment strategies are Form Three Integrated science syllabus, prescribed students science text book, prescribed science teachers guide, teaches' preparation books. Henning *et al* (2007) as well as Cohen *et al.* (2007) argue that documents and other artefacts are valuable sources of information and Henning *et al* (2007) continue to say that they cannot be co-constructed but be used. No matter whether it is old or new; printed or hand written or in electronic format, the fact is that if it relates to the research question it may be of value. The primary source of information in this case is the teachers themselves. The main interest is on junior certificate science teachers' in regard to their experiences and practice of outcomes and assessment strategies in Form Three.

Documents offer the researcher some advantage in they constitute data which is already organised and compiled by the relevant persons. Information in them is already in printed form, so the researcher did not have to go into the process of transcribing. However, documents may still be inadequate or inaccurate (Creswell, 1994), even though they may be coming from the relevant authorities. It was not every document from the relevant authorities which had relevant information, so the researcher had to be very selective and extracted only what was related to the phenomena under study.

According to Gall *et al* (1996, p. 356) document analysis involves:

defining as precisely as possible those aspects of a document's contents that the researcher wants to investigate and then formulating relevant categories that are so explicit that another researcher who uses them to examine the same material would find essentially the same proportion of topics emphasized or ignored.

Relevant documents were selected after selecting and thinking about the research question so that enough content could be gathered to assist with the answer to the first research question. The literature recommends that researchers identify a population of documents that can be used, and decide whether to use the whole population or to select a sample of the population (Gall *et al.*, 1996).

Various documents will be used as the source of data in document analysis (Bertram, 2004). Therefore, in this study the researcher analysed Form Three Integrated Science syllabus to find out what are outcomes and assessment strategies as given by NCDC nationwide. This document will help me to determine whether teachers are implementing towards given broad outcomes in their everyday teaching and assessing as directed by the NCDC. Secondly, the Form Three Integrated teachers' guide and learners' text book will be used to find out the suggested ways of dealing with individual topics in Form Three Integrated Science. Lastly, the teachers' daily lesson plan was used to get into what teachers are doing in their classroom, also to determine ways in which teachers implement outcomes and assessment strategies in their classes. The table 4.1 indicates the documents that the researcher collected data from.

Documents provide a good source for text data for qualitative study. They are in the language and words of the participants hence they are ready for analysis without necessary transcription also they can be used without conducting participants as a result of that they could be checked several times for reliability (Creswell, 2008). However, sometimes it is difficult to locate and obtain documents. In this study the principals were assured that the documents used would be treated with confidentiality and that the names of the school appearing on such documents were erased. The documents may be incomplete, inauthentic, or inaccurate. These limitations were overcome by the use of interview as another data collection method (Creswell, 2008). These instruments helped the researcher to get to the root of teachers experiences and practice of outcomes and assessment strategies of Form Three Integrated Science.

Table 4.1 Documents analysed and their sources

DOCUMENT	SOURCE
1. Form Three Integrated Science Syllabus	NCDC
2. Form Three Integrated Science teachers' guide	NCDC
3. Form Three Integrated Science learners' text books	Macmillan Lesotho
4. Form Three Integrated Science Teachers' lesson plans	Science Teachers

Concerning the learners' text book, only the chapter (or topic) that the learning and teaching would be taking place during the data collection were considered because a book have a lot of content with many different chapters or (topics).

4.7.2 Observation

Observation serves as a brief discreet instrument used to collect data Henning *et al* (2007). Observation schedule must be planned ahead of time in order to organise it in details. Batram (2004) define observation as a situation whereby the researcher goes to a school or classroom and observe what is actually happening. Furthermore observation can be structured or unstructured and it can be participant or non-participant. He continues to show that in structured observation the researcher has a very clear understanding of what to observe in the classroom while in unstructured observation the researcher writes down everything that is happening in the classroom (Bertram, 2004). In the participant observation the researcher is engaged in learning what life is like for an insider while remaining, unavoidably, an outsider. According to Jorgensen (1989, p.13)

Participant observation is a qualitative method with roots in traditional ethnographic research, whose objective is to help researchers learn the perspectives held by study populations. As qualitative researchers, we presume that there will be multiple perspectives within any given community. We are interested both in knowing what those diverse perspectives are and in understanding the interplay among them. This implies that the researcher joins the everyday routines and stays for a long time.

In this context non-participant observation will be used. Four participants will be observed in their Form Three Integrated Science classroom for about forty minutes each with the purpose of gaining first-hand data on identifying how teachers understand outcomes and assessment strategies in their teaching and why they understand outcomes and assessment the way they do. Each participant will be observed twice. Cohen *et al* (2007) demonstrates that observation data are attractive because they give the researcher a chance to gather ‘live’ information from ‘live’ situations.

Furthermore, observation is the act of noticing or watching. It may be more reliable and helps to “discover whether people do what they say they do or behave the way they claim to behave” (Bell, 1999: p 156). However, observation has its loop holes too; it is not an easy option because observation is not ‘natural’ gift indicates (Bell, 1999). Falconer and Mackay (1999) indicate that observation enables the researcher to gather data on the physical setting and human setting. Bell (1999) agrees that individual experience is at hand and in this research observation will help the researcher to understand teachers understanding of outcomes and assessment strategies of Form Three Integrated Science. There are a number of advantages when collecting data using observation the instrument of data collection.

4.7.2.1 Advantages of observation

McKernan (1996:61) consider observation to have the following advantages as a research technique:

Naturalistic enquiry: The study takes place in the natural environment of the participants rather than an artificial or contrived laboratory reconstruction.

Time sampling: Unlike the survey researcher, the observer can take as much time as is required to gain a representative sample of behaviour – ensuring that trends and behaviours are representative. The advantage is that unlikely as well as likely occurrences will probably be sampled.

Non-verbal behaviour: The observer can make notes on non-verbal behaviour, like facial and body movement and gestures, which are not available to the sample survey.

Through observation the researcher get information in depth rather than reported data. Observation is important because it gives all the information about the classroom interaction between the learners and their teachers. Cohen *et al* (2007) indicates that observation involves a well planned examination of everything that will be taking place. The schedule for the observation in this study is in such a way that this schedule will assist me to select aspects to focus on. Observation will also include the assessment strategies given to learners as well as the teachers' practice of outcomes in their Integrated Form Three classroom. Observation schedule which directs the researcher throughout the data production is given in Appendix E.

4.7.2.2 Disadvantages of Observation

Even though observation gives first hand information however, it has disadvantages like the ones stated by McKernan (1996:62):

Reactivity: With an observer present, unnatural behaviour of the teacher and the learners can occur and therefore produces unnatural results. That is, with a researcher present, respondents may behave uncharacteristically.

Small size of population observed: The fact that a group or individual is the focus of the observation may permit discussion of results only in relation to the case studied.

Generalisability: This is related to the above point; since cases studied are small, it is impossible to generalise the results to larger populations.

Data difficult to quantify: Unstructured modes of observation rely heavily on description rather than measurement and counting procedures. It is often difficult to impose a coding frame on massive amounts of qualitative data.

4.7.3 Semi-structured Interview

A meeting between two or more people is called interview and in an interview the interviewer collect information from the interviewee by asking questions and recording the answers by tape or through notes. According to Cohen *et al* (2007) interview

involves collection of data from direct verbal interaction between the researcher and the participants. Interview, if well designed and well conducted it provides in-depth information about what people do and belief. In this case interview helped the researcher to answer research question one and two, which are: what are the experiences and practices of Form Three Integrated Science teachers with regards to outcomes and assessment strategies? Why do the Form Three Integrated Science teachers experience and practice outcomes and assessment strategies the way they do?

The interview makes it easy to get insight of what a person (teacher) knows, likes or dislikes and what he or she thinks. (Sarantakos, 2005). According to De Vos, Strydom, Fouché and Delport (2002) in the interpretive research, the interview is used extensively. This is because interpretive research explores and describes people's understanding and beliefs so interview works towards achieving that goal. Cohen *et al* (2007) indicates that interview is a useful tool of data collection or data production because it allows the researcher to ask probing and clarifying questions and discuss with participants about their understanding.

Interview is different from everyday conversation in the sense that the researcher has in mind particular information that he or she wants from the participant. There are two types of interviews namely: semi-structured interview and unstructured interview. In a semi-structured interview the questions may require close responses or open-ended responses which are different expressions or opinions given by different respondents (Cohen *et al* 2007). In order for the participants to understand more about the topic observation or informal interview may come before the semi-structured interview (Rice & Ezzy, 2000). On the other hand unstructured interview is defined by Patton (2002) as a natural extension of participant observation, because they so often occur as part of ongoing participant observation fieldwork. He argued that they rely entirely on the spontaneous generation of questions in the natural flow of an interaction. In this research a semi-structured interview will be used.

Semi-structured interviews was used with the main aim of establishing the teachers' understanding of outcomes and assessment strategies because they enable researchers to gain a detailed picture of the participants' views on a particular topic (De Vos, *et al*, 2002). Semi-structured interview schedule where inductive and deductive questions

may be used (Rice & Ezzy, 2000), but researchers are only guided by the schedule, rather than dictated by it (De Vos *et al*, 2002). They further indicate that semi-structured interviews are more flexible, an interview guide, usually including both closed-ended and open-ended questions, is prepared; but in the course of the interview, the interviewer has a certain amount of room to adjust the sequence of the questions to be asked and to add questions based on the context of the participants' responses. This implies that the researcher was therefore able to probe if needs be and ask clarifying questions when necessary.

4.7.3.1 Advantages of Semi-structured Interview

Interviews have a number of advantages when compared with other data collection instruments such as questionnaires. Unlike questionnaires, interviews, when well conducted, provide in-depth data, and, because they allow both the respondents and the researcher to ask for clarification, increase the chance of obtaining valid information from the respondents (Cohen *et al* 2007). In this way it may be possible to get sensitive information that would not be easy to get otherwise (Gall *et al*,. 1996). These implies that interviews maybe considered as the most effective means of eliciting cooperation from respondents, as rapport can be established between the researcher and the interviewee.

According to Cohen *et al*, (2007) in this context semi-structured interviews would play important role as they are likely to have high response rate. Again they do not require the participants to have ability to handle complex documents or long questionnaires. They further indicate that the presence of interviewer can assist participants to answer complex questions. This implies that questions that may not be clear to the participants can be rephrased and probing questions can be used to assist participants in answering questions. Although semi-structured interviews may be time consuming but they are important for this study as they were also used as follow-up to clarify some concerns and aspects, and to get accurate interpretation (Cohen *et al*, 2007). Again, they may offer less anonymity since the interviewer knows the identity of the participants. In this way, the participants were assured of anonymity and confidentiality so that they would feel free to be interviewed (Sarantakos, 2005).

The interviews were tape-recorded, with permission of the respondents, to make sure that all the information is accurately captured, and so that the flow of the interview is not interrupted by the researcher taking notes, a problem which Fraenkel and Wallen (1990) warn about. The research literature also advises that tape-recording reduces the interviewers' bias or tendency to make an unconscious selection of data that favour them, if they are taking notes. Transcribing the recordings allows a second person to check the accuracy of the transcription, thus increasing validity (Fraenkel and Wallen, 1990; Gall *et al.*, 1996). There are still some negative aspects about interviews and they will be given below.

4.7.3.2 Limitations of Interview

On the contrary, interviews do have some potential disadvantages. Face-to-face interaction may in some way interfere with the respondents' answer due to the interviewer's tone of voice or facial expressions and hence, the interviewee feel like giving responses that will be acceptable to the interviewer (Cohen *et al* 2007). Interviews are also prone to "*subjectivity and bias on the part of the interviewer*" (Cohen *et al*, 2007, p. 300). For instance, interviewers may have the tendency to get answers to support their own preconceived views, or interviewers may interpret what the respondents say in a way which supports the interviewer's preconceived ideas (Cohen *et al* 2007; Opie, 2004). As a result, validity of answers from interviews relies on the skills of the interviewer. Furthermore, the presence of a tape-recorder may change the interview as respondents may be reluctant to express their feelings concerning sensitive issues if they know their responses are recorded (Gall *et al.*, 1996). Despite all these limitations, interviews, if well done, provide detailed, in-depth information which cannot be found using other instrument like questionnaires.

In unstructured interviews there were few prepared questions, usually with no set order, and the interviewer had to phrase questions during the interview according to the responses of the interviewee. They allowed the interviewer to deviate and probe further and in this way more detailed information can be obtained as interviewee's responses can be expanded (Gall *et al.*, 1996; Opie, 2004). Furthermore, unstructured interviews are that they make it difficult for the researcher to focus the respondent on the issue, and as a result a lot of unusable data may be collected (Gall *et al.*, 1996). Semi-structured

interviews were used in this study because they allowed for carefully prepared questions which ensure that all the areas of interest are covered, and nothing is left out.

4.8 Data Analysis

This study used Guided analysis because units of analysis emerged from both the theories and data. According to Samuel (2009) guided analysis is flexible in terms of allowing researchers to modify principles of theories to accommodate important issues that emerge from the data. Units of meaning will be selected (De Vos, *et al*, 1998). Concepts were then be grouped, related and categorized (Rice & Ezzy, 2000). Themes that emerge from data and theory will then be identified and recontextualised by referring to the literature (De Vos, *et al*, 1998). Findings relating to identified themes were then be reported.

4.9 Trustworthiness

This is a case study research so, the concepts of reliability and validity are not vital as they apply more in surveys and experiments (Lincoln & Guba, 1985). Validity in the research ensures that a study is judged by what it should be measuring. On the other hand reliability ensures that research methodology could be replicated and that it is consistent throughout the study (Merriam, 1998). Since this is a case study then trustworthiness will be considered. Lincoln and Guba (1985) think trustworthiness is related to the measure of the truth in a study. In the conclusion there must be some measures of sensible and accuracy presented.

Trustworthiness is the feature of qualitative research so to attain it the research will consider data collection instruments that will be fit for the purpose of the study (Cohen *et al*, 2007). These were ensured that generated data is trustworthy. Cresswell (2008) asserts that multiple sources of data give continual chances of checking data from one source to another.

Moreover, Lincoln and Guba (1985) maintained the importance of peer review in the data analysis process. Peers can de-briefly created an opportunity to conform if the findings are reasonable and justifiable (Lincoln & Guba 1985). They further indicate

that this can enhance the credibility, transferability, dependability and conformability of the study. There is an opportunity for critical feedback with suggestion that could be used to make my research processes and findings more logical and acceptable.

Lincoln and Guba (1985) conform that trustworthiness in the case study is also ensure by involving participants in the final data collected. To take this into consideration, after transcribing the voice recorded data, the participants were given chance to look through and verify, this means free access to all data. In addition participants were allowed to make some adjustment as they desire. This ensured conducive relationship between the participants and the researcher.

This study required a deep descriptive data of teachers' experiences and practices of Form Three Integrated Science with regard to outcomes and assessment so during the interview open-ended question and methods were required to probe for such information. According to Cohen *et al* (2007) teachers' lesson plans, learners' portfolios and interviews will give a large number of methods by which teachers' experiences and practices of outcomes and assessment strategies maybe accessed. Cohen *et at* (2007) consider this as triangulation and define it as the use of more than one method of data collection in the research which deals with human behaviour.

The choice of a multi-method (triangulation) approach is a means of ensuring the trustworthiness of data generated. "Trustworthiness, which is the extent to which any researcher's tool measures what is supposed to measure" (Holloway & Wheelers, 1996, p.162). Using multiple methods (triangulation) also allows for the prevention of personal bias (Denzin, 1989). Document analysis and semi-structured interviews will facilitate the process of trustworthiness. It is suggested that journalists and academic researchers who intend using these techniques, triangulate data by reading and asking their participants about what they read from documents (Berkman & Shumway, 2004). In this study triangulation will help to give more clarity about how teachers' experiences and practices of outcomes and assessment informed their practices in their Form Three Integrated Science classrooms.

4.10 Ethical Issues

Any research project should take into account ethical concerns (Wellington, 2004). Cohen *et al* (2007) maintained that ethical issues play important role in research, especially if it involves humans and animals. And to that end the researcher sought permission to conducting research from department of education (Leribe Education office), the principals of the selected schools and the participants. The researcher also kept the identity of schools and participants anonymous. The names of schools on documents that were attached to the research report would be deleted. Data collected from the participants was treated with confidentiality (Cohen *et al.*, 2007 & Rand Afrikaans University 2002)

4.10.1 Informed consent

Cohen *et al* (2007) indicates that in the consent letter the researcher must include how the research will be conducted, disseminated and any implications for participating in the study. The participants will also be informed that their participation is voluntary and that they are free to withdraw their participation at any time of the study if they feel uncomfortable. In addition they have all the rights to withdraw any information from the entire study if they wish (Rand Afrikaans University 2002).

The schools were identified and then the letter to the District Education Office with the purpose of seeking permission to conduct study in schools in this district. The letter explained the aims and the targeted participants. The other letters were sent to the principals of the participating schools with the same format and those letters explained these: the aims of the study, targeted participants, instruments of data production and all my contact details (email address and cell phone numbers). And lastly informed consent letter to the participants who were informed about the purpose of my study, instruments of data production, contact details and ask them to participate.

4.10.2 Confidentiality and anonymity

In order to ensure confidentiality anonymity, the identity of the schools and participants was kept anonymous (Bell, 2005). During the course of the data collection, the researcher asked permission from the participants for tape recording and video recording and therefore their anonymity will assure. To this effect schools were called school A and school B, and the participants were called participant A1, A2, and A3 from school A. Then participants from school B will be called participants B1, B2 and B3. In this case the names of participants will not be revealed in the reporting findings of the study and the names will not be identified on any part of the information. It was also be necessary to delete the names of schools on documents that will be attached to the research report (Bell, 2005).

4.10.3 Approval

The researcher seeked permission from the Education office before conducting a research in schools (Mncube, 2005).

4.11 Challenges and limitations

This a case study of two school in the country which have more than two hundred high school, as a result this is a limitation because data collected or generated cannot be generalized for all teachers in their respective schools throughout the country. There are many factors that would not allow generalization of the results for example socio-economic factors in sub-urban areas differ from that of rural areas, lack of apparatus in some schools and others. Instead the results from this study could be adopted in situations similar to the participating schools.

As a former student of school A, the researcher had no problem concerning gaining access to use it as the participating school. The principal who was the researchers Form Four class teacher welcomed her and introduced her to the head of Science department and the head of the department introduced me to his staff. Two science teachers who were the researchers classmate volunteered to participate in this study even before they get the core of my study. However, after going through the consent letter and discussing

with the participants the researcher learnt that the school was already practicing discipline based method in the teaching of Science Junior level therefore the research questions could not be answered. Then, another school had to be located which practices Integrated Science method.

The other school in the same area with almost the same biography as school B was identified. This other school was about six kilometers from the current school A. Also there was no problem regarding the access because the researchers' sister was a former teacher there. Almost every teacher knew the researcher. She was welcomed, and then explained the purpose of the visit to the principal with the help of the consent letter for participation for the principal. After going through the consent letter he called the head of Science department introduced the researcher to him and handover the consent letter to him. Everything seemed to be going well as the head of the department did not show any problem concerning this research. He promised the researcher that he had to discuss with his departmental members and asked her to call the school secretary after two hours. Hopefully, she believed she would get participants from this school.

Unfortunately when she called after two hours, the secretary told her that they have not said anything to her and advised her to call the following day. The following day, the same came up so the researcher decided to get there. When the head of the Science department was told that the researcher had arrived, he agreed to meet with her in the Science Office. In their discussion he showed that his fellow teachers have no problem but they agreed to participate on the next day. She asked to meet the participants but he showed that they were busy so she decided to give him consent letter for participants to read and sign so that the following day they just continue.

When the researcher got to the main staff room and chat with some of the teachers that she knew, she found out that the following day which was the Wednesday, 14th August 2011 the school was going on sports excursion till Saturday. She was disappointed and did not say anything to those teachers. The secretary invited her for tea and in their discussion the researcher opened up for her and told the story of coming the following day and the sports excursion. She wanted to tell the principal and to call the head of Science department but humbly did not let her instead agreed that the secretary raised the matter when the researcher is gone. Disappointed and tired in the taxi, she got a call

from the principal of this school apologizing and trying to find from her if he could organize participants for the study, unfortunately the researcher was not ready to go back and face that head of science department; she turned the principal down but nicely.

It was then that the researcher had to start thinking about another nearer school with almost similar context as the current school A. On the following day which was Wednesday she went to another school which is about seven kilometers east of school A, it was an Evangelical school with more or less similar context to school B. It was the researcher first time to be in that school since her high school days. When she arrived the principal was not around, but the lady who was assisting the researcher lead me to the deputy principal's office.

The lady in that office welcomed the researcher, the researcher explained herself with the help of the consent letter for participation for principals. She seemed interested because without the waste of time she called the head of science department explained story also with the help of consent letter. Without hesitation, the head of science volunteered to participant in this study (that is participant B1) then he had to find another teacher who would be considered as participant B2. Unfortunately, the other teachers rejected and did not want to participate. In their discussion with the participant B1 when arranging dates of data and what would be done during data production the researcher found out that he was doing Honors in 2010 therefore he had a clear understanding of why the study need to be conducted in that particular school.

The other challenge was to convince participants about the importance of voice and video recording of during the class observation after some time they agreed but participant A2 refused to photocopy his lesson plan. This means that the researcher have two photocopied lesson plans from participant A1 and participant B1. Video and voice recording were done in all lessons observed.

4.12 Chapter summary

This chapter discussed the epistemology, ontology and methodology that were used for this study. Only the research strategies followed in this study were discussed. It also presents procedures that were followed during data production process. The most important method of data production used will be document analysis and semi-

structured interviews. The sampling procedures were also taken into consideration. In order words it explores the design of how the study would be conducted and the validation of the instruments used for data production. The challenges that the researcher came across when identifying the participating schools were also elaborated. The next chapter provided the interpretation and analysis of data.

CHAPTER FIVE

DATA FINDINGS PRESENTATION AND DISCUSSION

5.1 Introduction

The previous chapter outlined the research design and methodology utilised in this study. This chapter focuses on presenting and analysing the data that were collected from the field. The data are presented using the themes and categories generated from the interviews. In addition, in presenting the data, the study would ensure that the voices of the participants were not lost. Therefore, verbatim quotations are infused in the data presentation. The emerging trends and patterns from the presented data are then outlined. Pertinent findings and discussion thereof in terms of research questions generated in Chapter Two and the theoretical and conceptual tools outlined in Chapter Three are presented.

This research is driven by two research questions given below:

1. What are the experiences and practice of Form Three Integrated Science teachers with regards to outcomes and assessment strategies?
2. Why do the Form Three Integrated Science teachers experience and practice outcomes and assessment strategies the way they do?

5.2 Data presentation

5.2.1 Description role of participants

The data presented were obtained from a case study of two high schools in Lesotho utilising semi-structured interviews, participant observation and documents analysis. In line with ethics in research, real names of participating schools, teachers and students have not been used instead pseudonyms are used. Teachers' biography also contributed positively to experiences and practice of Form Three Integrated Science teachers with regard to outcomes and assessment strategies. Participants' biography is given below while the participating school contexts have been given in Chapter Four under context of the school (4.2 Context of School). The biography of the schools and teachers are important because they helped the researcher to develop a deeper understanding into the

way participants behaved in this study. Moreover, a case study research suggests that a researcher provide a thick description of the research context (Cohen, *et al.*, 2007).

5.2.2 Profiles of participants

Participant A1

Participant A1 is a Mosotho man, aged between twenty one and thirty. He trained as a teacher at Lesotho College of Education (LCE) and he obtained Diploma in Secondary Education. Participant A1 had been a teacher for the past year. Participant A1 indicated that teaching had been his dream from as early as primary school. When doing Cambridge Overseas School Certificate (COSC) his Physics teacher encouraged him more about joining teaching service therefore, he consider his Physics teacher as his role model that is why he end up choosing to be a Physics teacher. Participant A1 has been teaching at this current school since his graduation. And for this one year experience he had some challenges in such a way that sometimes when learners are not coping or understanding he normally use Sesotho to clarify some problems in the teaching and learning.

Participant A2

Participant A2 is a Mosotho man, aged between twenty one and thirty. He has been teaching for the past four years. He studied at Lesotho Agricultural College where he obtained Diploma in Agricultural Education. Participant A2 has been teaching at this school since he graduated from the college. In the past four years he has come across different learners in different classes with more or less the same challenges. He indicated that workshops that he attended were not really solving any of his problems or challenges. He further indicates that he wanted to be the veterinary but unfortunately he did not get a good pass at COSC. In the same way if the concepts are not clear to learners' participant A2 also uses code switching. The code switching was also observed during participant A2's class observation.

Participant B1

Participant B1 is also a Mosotho man, aged between forty one and fifty. He has been in the teaching service for the past twenty-two years. He was trained at Mopeli Training College (MTC) which is now called DCE and he obtained Secondary Teachers'

Certificate. He taught in rural (mountainous) area for seven years then he moved to the lower lands (urban area). He indicated that the current school was the third in the low lands. Participant B points out that teaching had been his passion and enjoyed it. The only problem that he faced was that of learners showing less interest in reading and studying hard. Instead they are interested in technology, cell phones, games, music and television and this worries him a lot because Integrated Science involves a lot of notes making and reading so these learners do not have time for looking at their responsibilities hence it easy to achieve learning outcomes.

I have provided the biographical table below which gives information that as a researcher, I thought important as it could guide or clarify some issues concerning outcomes and assessment strategies with regard to their experience and areas of specialisation.

The table 5.1 below gives summary of biographical information about each participant:

PARTICIPANT	Participant A1	Participant A2	Participant B1
AGE GROUP	21 – 30	21 – 30	41- 50
TEACHNG EXPERIENCE	1 Year	4 Years	22 Years
TRAINING IN INTEGRATED SCIENCE	No	No	Yes
LENGTH OF TRAINING IN INTEGRATED SCIENCE (YEARS)	0	0	3
SUBJECTS OF SPECIALISATION	Mathematics & Physics	Agriculture & Biology	Mathematics Integrated Science, Biology & Chemistry
HIGHESTQUALIFICA TION	Diploma in Education	Diploma in Agricultural Education	Bachelor of Education Honours

In analysing this information about the participants, it appeared that two of them were trained on the discipline based pre-service training while one of them underwent Integrated Science training which was later cancelled after the participant had done the training. These two teachers have similar problems of concentrating on their areas of specialisation to the detriment of the other section which they did not specialise on. Their training which did not involved Integrated Science implies that dealing with this subject would not be easy at all. Participants A1 and A2 were not equipped on tackling outcomes and assessment strategies of Integrated Science because the table about their biographies revealed that they did not undergo the training on Integrated Science.

Furthermore, these two participants their teaching experience, which is less than five years, could also have an impact on how they approached the teaching of Integrated Science. In the field of teaching, teachers are gaining confidence as they do their work year after year (Leung & Wong, 2005). Experience plays important role in dealing with observable and measurable outcomes and proper use of assessment which include all stages that is assessing skills, attitudes and knowledge. Academics revealed that best practices in teaching and learning is not about presenting prescribed syllabus but it is about sustaining an effective learning environment (Stears & Gopal, 2010).

Mopeli Training Collage (MTC) which was changed to Dirobeng College of Education (DCE) was offering training on Integrated Science, but since the change occurred Science teachers are no more undergoing through Integrated Science training. The table revealed that two participants attended this training. The training was meant for science teachers to teach secondary level in Mathematics and Integrated Science. Integrated Science is a compulsory subject in all schools in Lesotho and science teachers are bound to teach this subject. As a result those who did not undergo this training are not effective in addressing the content and pedagogies needed for this subject (Stears & Gopal 2010). According to the Ministry of Education and Manpower (2002) the policy of self-reliance which was meant for promotion of principles whereby teachers were given practical guidelines concerning what have to be done, and have developed the expertise, that they will effectively carry new requirements into the classroom.

In other parts of Integrated Science in which they did not specialise on, they also seemed to take similar steps in solving problems they encountered by asking for help from their colleagues. In relation the information from the table one concluded that lack

of pre-service training and teacher development on Integrated Science contributed towards failure to address outcomes that are related to this subject and to use assessment strategies that cover knowledge, skills and attitudes. Ministry of Education, (2008) reviewed revealed that in 1989 the Ministry of Education came up with an idea to improve the quality of the country's Secondary Education through monitoring and evaluation of the county's secondary education and institutions are using a variety of systematic and wide-ranging strategies of assessment in connection to the outcomes.

However, participant B1 who underwent the Integrated Science training did not have any problem with regard to outcomes and assessment strategies in the teaching of Integrated Science. In addition, his experience of twenty two years could have played an important role as he had been back to the training two times after the receiving of his first qualification as the teacher. Darling-Hammond (2006) indicated that training enhance teaching strategies, pedagogies and approaches with regard to Integrated Science. Even though participant B1 had other problems but those were considered to be general to other subject but still those problems were hindering the effective teaching of Integrated Science. According to Ministry of Education, (2008) it is not enough to construct a syllabus and present information; the job of teachers now involves creating and sustaining an effective learning environment based on a wide range of outcomes with the best practices of assessment in teaching and learning. Table 5.2 below illustrated how the data was collected during the research.

Table 5.2 How data was collected

	Critical question 1	Critical question 2
Why was the data collected?	To identify form three integrated science teachers' practices of outcomes and assessment strategies	To understand the reason behind teachers experiences and practices of outcomes and assessment strategies of integrated science
What was the research strategy	Document analysis and observation were used	Observation and semi-structure interview were used.
Who (or what) were the sources of data?	Document: Form Three Integrated Science Syllabus, form Three Integrated Science teachers' guide, Form Three Integrated Science learners' text books and Form Three Integrated Science Teachers' lesson plans. Observation: Form three integrated science teachers	Form three integrated science teacher.
Where was the data collected?	The documents form part of school properties so they were used within the school premises and as for observation of form three integrated science teachers were observed in their respective classrooms	Observation of form three integrated science teachers were observed in their respective classrooms and semi-structured interviews were conducted in science laboratory offices for the three participants
How often was data collected?	For each participant A1, A2 and B1 their documents were analysed once before	The observation of participants A1, A2 and B1 was conducted once during

	observation and interview and the observation was conducted once during teaching and learning of each participants A1, A2 and B1.	teaching and learning and semi-structured interview was also done once per participant A1, A2 and B1.
How was the data collected?	The data was collected through analysis of documents and observation	The data was collected Through observation and semi-structured interviews
Justification the plan used for data collection:	Documents provided a clear picture of educators' experiences and practices of outcomes and assessment strategies. Observation gave a clear picture of what was actually happening in classrooms visited.	Observation gave a clear picture of what was actually happening in classrooms visited. Semi-Interview enabled the researcher to obtained/gained detailed understanding of participants experiences and practices of outcomes and assessment strategies of integrated science in form three.

WHAT ARE THE EXPERIENCES AND PRACTICE OF FORM THREE INTEGRATED SCIENCE TEACHERS WITH REGARD TO OUTCOMES AND ASSESSMENT STRATEGIES?

5.2.3 What are the experiences and practices?

5.2.3.1 Different learning abilities

In the teaching and learning environment, learners have different abilities and as a result the process of teaching and learning is influenced by different abilities (Cohen *et al*, 2007). During the interviews the participants indicated this problem of different abilities in the learning of integrated science. They differently stated that:

Participant A1:

...there are some slow learners difference in learning abilities in your class and you find it difficult to diagnose their problems,...

Participant B2:

...they do not get concepts at the same time, some are slow learners others are fast learners and this is a challenge...

With regard to participant A1 one could look at it from two angles: one being a teacher for one year means he was still learning some important techniques with regard to outcomes and assessment strategies especially when addressing skills, knowledge and values together how learners acquired information in Integrated Science. According to Leung and Yong, (2005) limited research on how Integrated Science teachers should cope with the difficult of outcomes and assessment in Lesotho especially if the teachers do not have long time teaching experience. Dealing with different topic of which some he was not trained on he was not on the side to deliver in a way that every learner could understood. Secondly, the training he underwent was on specialization he did not have chance to get into the training of Integrated Science so his practice of outcomes was only on lower order as transcribed lesson indicated in Appendix F. And the way he used verbal questioning only would not be as effective as expected and hence end up considering some learners as slow learners. Cohen *et al* (2007) indicated that teachers could improve in their performance provided they use different types of teaching approaches and assessment strategies to try to address all the learners in order to achieve outcomes of Integrated Science. They further indicated that some learners are independent and cannot be affected by any teaching approach in a class. One could further thought during his teaching of Integrated Science he had noticed some learners who had problems in written assessment and therefore consider them as slow learners instead of trying other assessment strategies.

These finding corroborated with what was observed in Participant A1's second class observation. In participant A1's teaching it was observed that same learners raised their hands every time the teacher posed the question. It looks like it was not about difference in learning abilities but the way in which the participant presents content to his learners and use assessment strategies to check the progress. He was relying on verbal questioning and therefore he was unable to combine different assessment strategies to

accommodate different abilities as indicated by Cohen, *et al* (2004). His biography indicated that he had only one year teaching experience and was not trained in the field of Integrated Science so this may suggest that learners were victims. According to Harden and Crosby (2000) if students are to achieve desired learning outcomes in a reasonably effective manner, then the fundamental task of the teacher is to get students to engage in different assessment activities that are likely to result in their achieving those outcomes.

Participant A2 did not mention the problem of difference in learning abilities but the researcher indicated that in participant A2 Integrated Science class, she observed that few learners were mostly active, reading for the class, correcting other learners if they got the question wrong and volunteering in class was done by very few learners. In the same way his experience and the fact that he did not undergo Integrated Science training would have impact in the way that he delivers content (Stears & Copol, 2010). So this implied that those learners who grasped issues and content faster than others were the ones who were recognized by the participant. In order to improve capabilities of learners, the teaching methods should be used in such a way that they would cater for everyone (Cohen, Manion & Morrison, 2004).

Participant B2 had twenty two years of teaching experience and out of his statement about the difference in learning one could say, he thought he was experienced in his teaching was not applying all pedagogies he learnt in institutions to address outcomes and assessment strategies of Integrated Science. Holt-Reynolds (1992) revealed that tertiary education is most likely to engage teachers in working hard to surface and reframing students' beliefs so that they would find the content of the course reasonable and worth learning. Allen (2004) and Dunn (2006) indicated different students learn and what students learn is always going beyond traditional measures that provide useful but limited student and programmatic data. Marzano, Pickering and Pollock (2001) and Blaz (2008) further revealed that an instructional strategy should adapt instructions to suit current need so that assessment strategies apply to stated outcomes of Integrated Science, transcribed lesson plan in appendix F revealed how participant B1 conducted the lesson. It could have been very important for him to always remember that different years brought in different groups of learners, therefore variation of assessment strategies

would have helped him to cater for individuals in terms of achieving stated learning outcomes.

5.2.3.2 Broad syllabus

According to the Ministry of Education (2008), Integrated Science is the combination of three disciplines which are: Biology, Chemistry and Physics and each of these have to be equally taught. Furthermore, Form Three Integrated Science syllabus has many topics because it is the combination of three disciplines namely: Biology, Chemistry and Physics. For example in Biology there are introduction to reproduction starts in Form One, then in Form Two it is split into reproduction in animals and plants then completed in Form Three where the outcomes are based on reproduction organs. All of them need to be attended by the end of every three years of Junior Level so that learners may be assessed. The participants indicated that:

Participant A1

Looking at the remaining part of the syllabus, I think I will manage to finish Physics part of the syllabus only and I will be left with five topics of Chemistry and about seven or eight of Biology

Participant A2:

For the past three years I learnt that I never managed to finish the prescribed syllabus because Integrated Science is too broad as it involves three disciplines

Participant B2 revealed that:

Another thing is the syllabus, it is too broad, going back to slow learners you end up doing only half of your work for the year, then the following year you have to finish what was left in the previous year before you start the work of the next year. It is really challenging.

The three participants seemed to be looking at the broadness not what is contained (content) that learners would be expected to demonstrate at end of learning period. In their cases they did not take into consideration that what learner get would be reflected at the end of JC when they sat for Junior Certificate. This can also imply that three of them failed to manage their time because the Integrated Science syllabus has indicated number of periods per topic. There was no corroboration between syllabus reviewed and the scheme and record of work reviewed of participant A1, the syllabus had four periods on centre of gravity but in the scheme and record of work he planned to have six

periods. During the lesson observation the activity was meant for fifteen minutes but he extended it to cover the whole lesson. In this way some topics which were not yet done are going to be given less time than expected time. Anglo (1999) revealed that assessment planning can only occur when properly supported with appropriate time. Lambert and Lines (2000) mentioned that time management involved more formal contexts and procedures including written and timed tests assessed together with practical. In the same way with Participant B2 what he said corroborated with documents reviewed, he had an activity which was supposed to be done for twenty minutes from the book but it took the whole forty minutes. In that activity learners were actively trying to find out the effect of pressure on states of matter. In this way, one may say that the syllabus is not broad but the participants failed to manage their time which is very important in the teaching because if not well managed then failure to finish prescribed syllabus.

5.2.4 Challenges and how to resolve

5.2.4.1 Insufficient training

The purpose of this study was to investigate teachers' experiences and practice of Form Three Integrate Science with regard to outcomes and assessment strategies. Two of the three participants admitted that they experienced some challenges in addressing some broad and learning outcomes and assessment strategies of Integrated Science to address knowledge, skill and attitudes. These were also revealed during class observation as these two teachers concentrated on Science disciplines that they preferred most to the detriment of the others and therefore failure to help learners to achieve outcomes of Integrated Science as combination of those three disciplines. Even though participants B1 had problems, they were not related to the outcomes of integrated science instead the problem was the same across all the teachers. The first participant indicated that:

Participant A1:

....Of course maybe you are not familiar with those subjects which I never dealt with from High school to the institution more especially I can say I hate Biology very much but then, I must teach it...

Based on class observation, the two lessons observed in Participant A1 were on Physics topics and the learning outcomes were achieved as the learners were able to define the centre of gravity which was the topic for that particular day by the help of the verbal questions which were used assessment strategies he used in the class, this corroborate with what the participant said in the interview.

Participant A1 declared that:

Physics part of the syllabus is the one that I finish because I am left with few topics as compared to other disciplines...

Since observation was done in two different streams, which were Form One and Form Two, one would not have expected the topics to be on Physics only. Participant A1 was aware that the researcher would be visiting therefore he decided to address the outcomes and assessment strategies of Physics which is one part of the syllabus. In addition, looking at his scheme and record of work most of the topics he planned for the quarter were the physic topics with two Chemistry and one Biology topics. There is corroboration in three instruments used to collect data with regard to his concern when it comes to Physics part of the syllabus. Stears and Gopal (2010) revealed that science teachers who are trained on discipline base are challenged by using various assessment strategies for example participant A1's class observation was based on verbal questions which involved only lower order questions for example he asked “*what is the center of gravity?*”; “*what will happen if you shift your pencil?*” these are recall questions, higher order questions were not addressed.

Observation revealed that Participant A2 preferred Biology; the researcher had two observations at different times but in the same class which was Form Two. During the first observation it was observed that the previous topic was on Biology because during the introduction of the lesson assessment was based on photosynthesis. Transcribed lesson in appendix F revealed that the topic that was presented during the first observation also was a Biology topic called Locomotion and Support. That topic was completed during the first observation and one would have expected that the next topic had be on Chemistry or Physics but even the second observation was still on Biology so this corroborated with what the participant implied in his statement when he said:

Participant A2:

As teachers we lack some information here and there for example I do not know anything about Physics and it is difficult to teach those topics,

in addition it is therefore somehow so difficult, you are not able to express yourself in order to make your class so enjoyable

Moreover, the documents reviewed which included scheme and record of work provided by participant A2 indicated that Biology was the subject that he preferred to teach because for the quarter he had three topics of Biology, two topics on Chemistry and only one on Physics. This implied that Participant A2 was challenged by other parts of the Integrated Science but unfortunately he had to teach this subject because Integrated Science is a compulsory subject in the secondary level in Lesotho.

5.2.4.1 Solution to insufficient training

In trying to solve this challenge they both indicated that:

Participant A1

I used to ask my colleagues about some topics in Biology and Chemistry and if I cannot grasp what they explained, I normally asked them to teach any particular part for me.

On the other hand participant A2 revealed that

I normally go an extra mile by reading more about the topic that gives me problems and if I failed to get to root that is then that I asked for help from my colleagues.

These implied that for this challenge they take similar steps of asking for assistance from their colleagues who underwent Integrated Science training. These teachers are taking responsibilities of using other teachers as their resources in their Science Department. In this way we are considering experienced and non-experienced as the useful resources of schools. According to Spillane and David (2007), social network of science teacher, grounded in their subjects facilitates understanding of scientific outcomes and assessment strategies. The practices that teachers share allow for the formation of social ties through which expertise can flow, and the more that particular teachers share ideas about outcomes and assessment strategies of Integrated Science, the more readily information and knowledge is likely to flow (Brown & Duguid, 2000).

5.2.4.3 Workshops

These two participants' experiences were of less than five years, which one would have expected the in-service training of outcomes and assessment strategies in Integrated Science. Workshops and networking amongst Integrated Science teacher were not effective as Participant A1 showed that

...sometimes we go for one day workshop, after the workshop we are still lost because the presenter normally have a lot of information that need to be delivered at least for a week. So this make me always come back from these workshops being more confused.

Participant A2 indicated that

.... the workshops we attended are meaningless because they sometimes address one or two topic and this is done during one or two days. There is a lot of information which they expected us to gain within a very short length of time.

They cannot resolve this problem, so what they did is to continue attending even though it is of no use for their teaching of Integrated Science. Most of the times these teachers seek help from their colleagues. Participant A2 further indicated that he is no more attending any form of workshop which is basically meant for equipping Integrated Science teacher from different areas of specialisation. Participant A2 indicated that

It is like we are wasting our time, it is much better to ask colleagues other than going for eight hour workshop which will be covering a lot of information that cannot be handled.

Untrained for the teaching of Integrated Science is the problem because the teacher had to address learning outcome and help learners to achieve them with the help of relevant assessment strategies, and in trying to work out the problem of this subjects they did not specialised in brought another problem. Workshops which were meant to help them failed because participant A2 revealed that they were over loaded with information that they did not handle. The Ministry of Education (2008) argues that through the subject panels from NCDC teachers should be equipped to address the broad outcomes by working together with the teachers and the examiners from ECoL. Darling-Hammond (2006) and Lieberman (2000) indicated that teachers' informal experiences have significant influence on their practice on their daily duty of using assessment strategies

to check the outcomes in Integrated. Goldenberg and Gallimore (1991) further showed that understanding socio-cultural phenomenon contributed towards better practice of outcomes and assessment strategies by teachers. As much as the Ministry of Education tries to address this but the way the workshops were done was not bringing any solution rather making participants to run away from those workshops. In analysis of this information the problem did not lay with the participants but the lack of Teacher Professional Development during pre-service and in-service training in relation to outcomes and assessment strategies of Integrated Science.

However the third participant demonstrated different challenges which still hinder the effective teaching and learning of this subject. Participant B2 did not experience the challenges participant A1 and participant A2 had because he was trained on Integrated Science subject. Participant B2 indicated that

Learners are showing less interest in reading and studying hard which is affecting the performance of Integrated Science as there are lots and lots of notes to be read.

With regard to participant B2's documents reviewed, which was the scheme and record of work for the quarter, he tried to balance the topics because for the first five weeks of the quarter he had one topic for Biology, one for Chemistry and one for Physics. This implied that the remaining part of the quarter he was going to follow the same pattern that he started the quarter with. The problem he shared during the interview did not involve outcomes and assessment strategies of Integrated Science but the general problem that learners are showing less interest in reading and studying hard which is affecting even other teachers in their classes and this problem hinder effective addressing of outcomes and assessment strategies of Integrated Science.

In analyzing the participants' experiences with regard to outcomes and assessment strategies, one may say that the training of teachers in Integrated Science need to be re-considered as it is discipline based and there are after effects when it comes to teaching. Angelo (1999) revealed that explicit identification of learning outcomes facilitates the educational coherence about their goals. Angelo further indicates that sharing those expectations explicitly with learners can provide an effective learning scaffold on which learners can build their experiences and render effective performance when assessment

is applied. Schools, Colleges and universities are increasingly turning to both national developed and local designed methods and instruments as a means of improving teaching and learning practices (Allen 2004). Ministry of Education (2008) eluded that there must be a link between outcomes and assessment strategies to teachers' understanding as this is the only way of developmental and improvement of teaching and learning, if teacher are not competent in the stating measurable and observable outcomes then all levels of assessment (knowledge, skill and attitudes) will not be addressed hence ineffective delivery in the teaching and learning process (Leung & Wong, 2005).

5.2.5 Importance of learning outcomes

5.2.5.1 Effective teaching of Integrated Science

Participants in this study also indicated the importance of outcomes in the learning and teaching of integrated science which they take into consideration every time they are in action.

Participant A1:

...I think is to improve learners with higher technology, they should be familiar with the technology and have inquisitive mind set even logical thinking.

On the same issue participant A2 indicated that:

I do not know if those words are wrong or not but I used to say eh,... today we are going to learn about something and that means at the end of the lesson I am expecting everyone to be able to define or explain. I have learnt that the learning outcomes/objectives help the learners to pay attention on what we are going to do on that particular day. That is why I used to state them before I can teach my lesson.

During the two class observations that the researcher had in participant A1's teaching, the researcher observed that he mentioned the learning outcomes and in his teaching he used assessment in the form of verbal questions for his learners which were in line with the outcomes.

Extract from participant A1's lesson plan:

Subject: Physics

Class: Form 3

Topic: Equilibrium and Gravitational Force

Date: 06-09-2011

Subtopic: Centre of gravity
minutes

Duration: 40

Outcomes: familiarize learners with gravitational force and centre of gravity

Objectives: By the end the lesson, students should be able to:

1. Identify the centre of gravity of any object.
2. Define Centre of gravity

Teaching Method: Discussion and demonstration

Teaching Materials: Ruler, Pen or Pencil

The first lesson was a practical class of which at the beginning he stated the learning outcomes, that is what is expected of the learners by the end of their practical. In class participant A1 stated learning outcome as:

now I would like us to talk about the centre of gravity. This is our main topic today

This corroborated with the lesson plans he had for the two lessons observed. The learning outcomes were clearly written at the beginning of the lesson plan as indicated on the extract above. However it was confused with the objectives. Gosling and Moon (2001) clearly stated that learning outcomes are sometimes confused with objectives. He used the broad statement as his learning outcomes whereas the learning outcomes are related to what learners have to be competent in after the lesson.

Extract from participant B1's lesson plan:

Subject: Physics

Class: Form 3

Topic: Particulate Nature of Matter

Date: 06-09-2011

Subtopic: Centre of gravity
minutes

Duration: 40

Outcomes: At the end of Form 3 students should be able to:

1. Describe the three states of matter in terms of attraction of forces between particles
2. Illustrate the arrangement of particles in the three states of matter.

Teaching Method: Learners activity

Teaching Materials: syringe, water, and air.

After the activity learners answered the following questions:

<i>State of Matter</i>	<i>Solid(Stone)</i>	<i>Liquid (water)</i>	<i>Gas(air)</i>
<i>Does it keep shape?</i>			
<i>Does it get smaller when squeezed?</i>			
<i>Does it need container to hold it?</i>			
<i>Does it have a definite volume?</i>			

Willingham (2004) reveals that teachers need to understand the importance of having clearly stated learning outcomes in order to choose the best learning assessment strategies and this could be possible when teachers plan the assessment implement and then gather information about the outcomes. In addition, Angelo (1999) states that explicit identification of learning expectations facilitates the educational coherence about their goals. Angelo further indicated that sharing those expectations explicitly with learners can provide an effective learning scaffold on which learners can build their experiences and render effective performance. This implied that, outcomes can be specified in a developmental hierarchy, where possible.

However, the extract from participant B1's lesson plan does have outcomes which are stated as objectives because they indicated what learners would be able to do at the end of the lesson (Gosling & Moon 2001). This further indicates the problem teachers have in stating learning outcomes in their class as they usually confuse them with objectives which are clearly indicated above. Objectives are for teachers but outcomes are achieved by learners as they should be observable & measurable. Forehand, (2005) revealed that instructional learning outcomes are specific statements of student performance that should be demonstrated at the end of a lesson. The objectives stated in the extract would have been addressing the cognitive domain of learning outcomes which was about intellectual skills and abilities under comprehension.

5.2.5.2 Scientific skills developed

The researcher showed that in his teaching, Participant A2 stated what he expected from the learners before they continuous with the content of the day. During the two observations, after introducing lesson Participant A2 spelled out to his learners what is expected from them by the end of lesson. For example in the second lesson he said:

at the end of this lesson you should be able to define skeleton and give different functions of skeleton and try to identity different parts of the skeleton

Participant B1:

I consider the purpose of the outcomes is to check whether you are adhering to the concepts that you are teaching. Observable objectives/outcomes or the ones that you can measure we can see them through their work; I think these ones occurred because they are observable. Maybe the non-observable can be observed later in their later stage of their lives they can be able to apply them.

Observed lesson of Participant B2 which was a practical also had a clearly stated purpose of the day that is what was expected from learner at the end of the learning period. The information corroborated with lesson plan reviewed, his lesson plan started with the learning outcomes which were written as:

At the end Form One learners should be able to: Describe the three state of matter in terms of attraction forces between particles and to illustrate the arrangement of particles in the three states of matter.

The information presented above corroborated with what is suggested in the theoretical framework which is, the test items are derived and compiled from organised and clearly formulated teaching objectives or outcomes (Fraser, Loubser and Van Rooy 1990). One of the most famous schemes of classification of levels of handling information is that which was developed by Bloom, Krathwohl and Masia (1956) and later simplified by Bloom, Madaus and Hastings (1981). They further indicate that in the process of teaching and learning, learners are trained to handle and work with information to different levels of complexity and therefore show scientific skills developed.

In analyzing the participants' experiences with regard to outcomes, we note that they considered outcomes in different angles Participant B1 considered outcomes from the broad outcomes of Education in Lesotho. Mioduser, Richard and Gong, (1998) consider broad outcomes as the operational target and priority strategies in education system. Participants A1 and A2 were looking at outcomes from what was achieved at the end of

the learning period of forty minutes which is learning outcomes which was earlier defined by Ramsden (2003) as a way that covers the range of necessary competences and emphasises the integration of different competences in the teaching and learning of Integrated Science.

In addition, application of gained knowledge in future which Participant B2 indicated is also supported by Rice (1996). It was indicated that subject outcomes refer to skills and techniques learnt and applied in real life. The conceptual framework which is social constructionist used in this study clearly indicated that there are a number of assumptions in reality, knowledge and learning (Kim, 2001). Likewise, Burr (2003) contends that reality, artifacts and social construction are assumptions in social constructionist which are not actually objective about the world but independent of human subjective.

5.2.6 Assessment strategies

5.2.6.1 Effective assessment

The participants in this study take assessment as an integral part of learning and teaching as they indicated that:

Participant A1

I think objectives can be assessed by asking the learners questions to that you can see if they understood, learners should form some groups and discuss about the topic then they should provide their answers. After passing each and every stage I have to assess that stage so that I can see that learners get the main theme of the topic.

The second participant A2 showed that

I used to ask them questions or give them the test or class work which tells me whether they have understood or not. I use different types of assessments; sometimes I give them homework like I did today.

Information gathered during class observation revealed that participant A1 used assessment in the teaching and learning of Integrated Science. He used to pose questions time and time to check if he was still moving along with his learners. For example the types of questions he asked were meant for learners to apply existing

knowledge, to get information and all those questions were related to the learning outcomes that were stated at the beginning of the lesson. He spelt learning the learning outcome as “*at the end of this lesson I am expecting you to define ...*” this simply implied what was expected of the learners to have acquired. What they would be competent in and according this one is to define which is level one of recall (cognitive domain) Participant A1 had stages which he asked questions after each stage. This goes hand-in-hand with what was written in the lesson plan because different stages of his lesson plan had questions to be answered by learners to show that they are on the same trek with the teacher.

Lesson observation revealed that Participant A2 used formative assessment as a tool of achieving stated outcomes, the evidence in appendix F indicated that this assessment was used during the observation. In his lesson he asked learners questions on different stages of the lesson that is from the introduction, he introduces the lesson with questions that were related to previous lesson, development of the lesson still questions were his tools of checking progress of learners. Participant A2 did not have stages but he was asking questions time and time to check learners understanding and to confirm to the content he was teaching. The second lesson observation, at the end of the lesson he gave learners homework which was suppose to be submitted the next day.

Participant B1

We have books that have activities, so through the use of these activities they help us to see if the learners understand, at the end of the topic we normally give formal assessment where they are given question to answer.

Participant B2 used Integrated Science text book activities which have questions to guide learners through practical. The experiment that learners were conducting was fully described that is all procedures were given. At the end the task was concluded with question that helped learners to conclude on their experience.

Participant B2 who used Integrated Science text book activity which had questions, for example the questions from the textbook were:

From your observation which of the two materials, water and air can be compressed more easily?

Explain your answer above relating to experiment conducted.

This corroborated with the lesson plan for the activity. He did not relay on questions from the textbook. He had questions for learners to answer after the activity in addition to those questions that were given in the textbook. Even during the activity he had some questions which he used to find out if learners were still on the right trek. Observation revealed that learners were able to conclude as they were guided by good questions throughout the activity.

In Chapter Two different researchers indicated the importance of assessment in the learning and teaching of integrated science, for example Suskie (2004) sees assessment as the ongoing process of getting clear, measurable expected outcomes of learners learning when ensuring that enough and good opportunities are given to learners to achieve those outcomes. Agreeably, Mitchel (1989) and Department of Education (2002) define assessment as process of gathering evidence using a number of strategies about individual learners' competence. In addition formative and summative assessment is used to check if the learning outcomes have been achieved.

In support to literature (Suskie 2004, Mitchel 1989 and Department of Education 2002), theoretical framework of this study showed that Bloom's taxonomy provides details of construction of assessment which relates to the stated learning outcomes at the beginning of the lesson. There are three important components that need to be considered in terms of using Bloom's Taxonomies, namely Cognitive, Skills and Attitude.

These responses correspond to what was observed in different lessons of the participants, documents reviewed that assessment is used in their teaching of Integrated Science. These corroborate with the lesson plan of Participant A1 and Participant B2 where they had verbal questions as part of their assessment in their lesson plans which learners had to answer. Also the text book that Participant B2 used for the practical the one his learners were doing was having written questions which were related to the stated comprehension outcomes at the beginning of the lesson to check if those learners were following and leading towards achieving the outcomes stated.

Forehand (2005) stated that Bloom's taxonomy of educational outcomes should be related to different the form of assessment in the teaching and learning environment. This implies that teaching and learning of Integrated Science in JC should take constructivist strategies where learners would be on the side to deal with why part of learning that is higher level thinking that promotes personal meaning and situated and contextual learning (Fischer, 1997). He further indicated that constructivists see learners as being active rather than passive. Knowledge is not received from the outside or from someone else; rather, it is the individual learner's interpretation and processing of what is received through the senses that creates knowledge (Ministry of Education, 2008). The learner is the center of the learning, with the instructor playing an advising and facilitating role with the help of SMART outcomes that are facilitated by good assessment strategies.

Why do the Form Three Integrated Science teachers experience and practise outcomes and assessment strategies the way they do?

5.2.7. Why experience and practice?

5.2.7.1 Challenges

This study was triggered by the fact that in the colleges and universities, science teachers are trained or taught along the subject lines that is specializing in Biology and Chemistry or Physics and Chemistry or Physics and Mathematics but when they pursue teaching they have to teach integrated science which the combination of Biology, Chemistry and Physics and this subject is a compulsory subject. The rationale and objective of this study in Chapter One indicated that the government has made effort to encourage proper training of teachers in the areas of Physics, Chemistry and Biology.

Participant A1 declared that:

I can say I hate Biology very much but then, I must teach it. Physics part is the one that I normally finish first.

Findings from the two lessons observed indicated that Participant A1 had passion for Physics as his lessons were on Physics only. Also, the documents reviewed indicated clearly the statement written above because he had three topics for physics, two of chemistry and one on Biology. One would have expected the balancing of topics on the scheme of work for the quarter since there were six topics it was supposed to be two per

discipline. There is corroboration of information from the interview, observation and documents reviewed.

Participant A2 indicated that:

... I do not know anything about Physics and it is difficult to teach those topics. That is why I use to finish Biology part before other parts. Another part can be Chemistry because I also did Chemistry at COSC level.

The information gathered from the interview corresponded with the lesson observations where the Biology topics were treated one after the other, without considering other parts of the Integrated Science. Even the scheme of work revealed that the teacher had three topics on Biology, two of Chemistry and one of Physics. In the same way one would have expected balancing of the topics in Integrated Science so that all the learning outcomes of Integrated Science are treated in terms of knowledge, skills and attitude together with the assessment strategies that included among others written tests, assignment, portfolios and others to make sure that outcomes are SMART that is Specific, Measurable, Achievable, Realistic and Time-bound have been achieved (Forehand, 2005).

However, the third participant B1 who was trained on Integrated Science did not experience what other two participants experienced. He had other problem which was not related to the outcomes and assessment strategies of Integrated Science but still this problem hinders the perfectness of teaching and learning of Integrated Science.

*...our learners seemed to have lost interest in their school work especially to read. I sometimes ask teachers of other subject if they have the same problem that we have in Science and they do have that problem
Even with my own children at home I have to chase them to read instead they are interested in watching television or do other things or play games instead of reading*

Participant B1 talked about another problem of learners losing interest in learning seemed to be difficult as during the interview he showed that even other teachers are complaining that learners are no more interested but are concentrating on other things like cell phones, television games (he generalized it as a technology problem during the interview). He indicated that

.....as much as I told them what the next subtopic would be, the learners are not going to go through that part before because they seemed to have lost interest in reading and doing their school work.

One may think that students were told about the next subtopic to read ahead of their lesson and ask questions where they do not understand relating to stated learning outcomes or even being on the side to respond positively to formative assessment.

Many of these teachers have not experienced integrated science practices during their pre-service training (Austin, 2010). Much of their pre-service training focused on the discipline-based knowledge as an outcome (Oludipe & Oludipe, 2010). Therefore, outcomes and assessment strategies of the Form Three integrated science as understood by the teachers is essential for teaching and learning in the Science classroom in Lesotho (Stears and Gopal, 2010). This problem came up during the data collection where participants showed challenges with regard to areas of Integrated Science they were trained for. From the above discussion, one may see that Form Three Integrated Science teachers are compassionate about their subject of specialization from their tertiary's that is colleges and universities. Teachers' biographies played important role because they clearly showed why particular participant finishes particular part of integrated Science first. In response to the second research question personal training influenced the way in which individual teachers (participant) teach.

The Ministry of Education had not done enough to construct a syllabus and present information the job of teachers now involves creating and sustaining an effective learning environment based on a wide range of "best practices" in teaching and learning (Ministry of Education, 2008). Austin, (2010) agreeably said the fundamental role of assessment is to provide a complementary methodology for monitoring, confirming, and improving learners' learning. In this case teachers understanding of assessment strategies contribute towards achieving preferable outcomes in Integrated Science class as they would know what to assess and the correct instrument of assessment (Austin, 2010).

In analyzing the participants' thoughts, there is still a need for the government to look at the training of teachers, that is re-visit the pre service training of teachers at colleges and universities in order to assure quality results of learners at Form Three Integrated

Science results. Or even to look at how in-service training is carried out with the purpose of helping Science Teachers who did not undergo Integrated Science training.

5.2.7 Outcomes

Stating of learning outcomes from the participants was never considered to be measurable or observable; this was observed in their teaching, from the semi-structured interviews and from their documents (lesson plans of two participants). Participant A1's lesson plan showed the learning outcome as "*students should be able to:*" and during the semi-structured interview he said he is used to state them as "*they should be familiar*". And lastly in his class he stated the learning outcome as "*I would like us to talk about the centre of gravity, this is our main topic*".

Participant A1 indicated that he stated the learning outcomes as:

...at the end of the lesson I will eh... assess my learner by asking them some question or just tell the learners to summarise the topic that we talked about so that I can see if the objective have been achieved...

As indicated earlier that teachers are not looking at observable and measurable outcomes the statement above by participant A1 was not addressing this issue of observable and measurable only interested in finding out if objectives have been achieved or not. Forehand (2005) indicated that learning outcomes must be stated with action verbs which indicate what the learners would be able to do at the end of the lesson. This was also discovered on his lesson plan that the way he wrote them did not take into consideration observable and measurable outcomes, this imply that objectives should not always observable / measurable because they are teachers' intention but Outcomes should be SMART. On the lesson plan he had them as objectives and he wrote, "*by the end of the lesson, learners should be able to give....*" According to Forehand, (2005) action verbs included verbs like state, define, list, illustrate, compare and contrast.

Participant A2's observed lessons clearly stated that "*At the end of this lesson I am expecting each and every one of you to explain or define....*" and from the second lesson he also showed that "*that means at the end of this lesson I am expecting you to know or explain what....*" In relation to SMART objective, at the end of the learning period

learners would be expected to explain which was stated by the participant A2. And during the interview he showed that he stated learning outcomes as:

*I do not know if those words are wrong or not but I used to say eh....
today we are going to learn about something.*

Participant A2 clearly showed that he is aware of observable and measurable outcomes but the correct way of stating or writing is still a problem. In the same way he was only interest in getting somewhere by the end of the learning period.

Participant A2's lesson plan showed that he wrote them as "*At the end of Form A Students should be able to*" however, this could be considered as the *broad outcomes* which are operational target and priority strategies in education system as defined by (Mioduser, Richard and Gong, 1998). During my interview with Participant B1 he indicated that when stating learning outcomes he used to say "*at the end of Form A(1) If I am teaching Form A's, learners should be able to*".

This information corroborate with the documents reviewed which were the lesson plan. On his lesson plan he wrote: "*At the end of Form A Students should be able to...*" And the Integrated Science text book used for the lesson had the aim of the experiment as "*to see what happens when you compress a liquid and a gas.*"

The literature reviewed in Chapter Two showed that Khoza's (2001) study on the outcomes of a computer literacy course which was offered by UniSchool demonstrated the importance of linking lesson outcomes to lesson activities or assessment strategies. He found that about forty percent of the learners failed computer literacy course because other outcomes were not observable or measurable to guide the facilitators on how to measure their learners' performance. From his study one may conclude that clearly stated outcomes that are observable and measurable. Assessment strategies should also be linked to outcomes. So if teachers are not competent in some other parts of integrated science syllabus then teaching will be affected.

This also applies with assessment strategies as we cannot divorce the two if outcomes of integrated science need to be addressed from the pre service training then the assessment also need to be taken into consideration (Stears and Gopal, 2010). These

corroborate with literature in Chapter Two where the Ministry of Education and Manpower Development (2002) point out that there are some outlines approaches needed to develop effective plans for assessing student learning in the major. These include identifying goals and objectives, describing instruments or methods for assessing students' achievement at important stage of learning and lastly determine how the results will be disseminated and used for teaching and learning improvement.

This implies that from this data, one may say that there are many things that come up during the teaching and learning of Integrated Science in Schools not only the outcomes and assessment strategies. Also during the observation of lessons, teachers were focusing on using discussion and questioning methods. This confirms the ideas from individual interviews, the documents reviewed (lesson plans) as well the observation done in their classrooms that there was a need for their pedagogical approaches which they needed to have acquired from their training. The pre-service training needs to address the teacher professional development seriously in order to have hundred percent pass rate in JC Integrated Science (Ministry of Education, 2008).

Moreover, (Austin, 2010) explains out that traditional assessment is curriculum-driven. As a result it does not provide in-depth assessment of knowledge and skills that indicate mastery of a given subject and learners are not constructing their own meanings. This brings the idea of the behaviourist approach which concentrates on what part of schooling (Ertmer and Newby 1993). This implies that formative assessment maybe use to check daily process of learners on different aspects that are taught time to time. This corroborate with theoretical framework because according to Bloom's Taxonomies assessment should have different levels of assessing from easy to application where learners have to apply what they learnt in new situations so if teachers relay on question and answer and discussion only learners are not on the side to have deeper understanding of Integrated Scienc

5.3 Summary of the findings

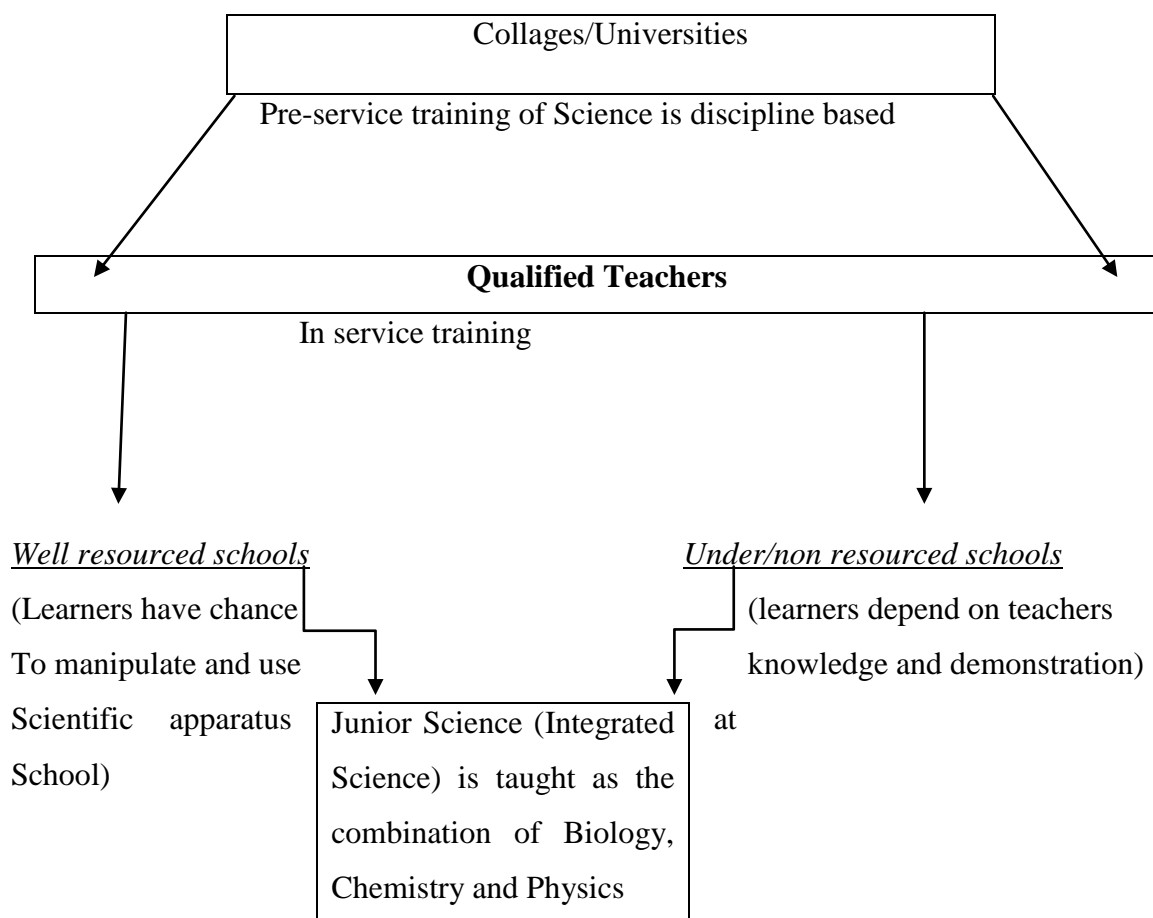


Figure 5.1 based on *Graham Young's "On Walk the Talk" presentation skills. (Young, 2009)

This summary resulted with the findings below based on the research questions.

5.4 Key findings of the study based on the research questions:

Like Nigeria and Columbia where schools still have integrated science Lesotho is facing the same consequences of discipline training of science teachers who are expected to teach integrated science as indicated in Chapter Two. Looking at the participants' experiences and practices, one may indicate that participants' practice inevitably rolls out into their experience in dealing with outcomes and assessment strategies of integrated science in form three.

- Attending slow learners, that is giving them extra time on every piece of work given result with unfinished prescribed syllabus because the prescribed syllabus is too broad and needs enough time or all the time allocated.

- Importance of learning outcomes in the teaching and learning of Integrated Science as they guide towards the proper use of measurement at the end of learning session.
- Challenges that come as a result of being trained on discipline based. Areas of specialization are given priorities over other parts of Integrated Science.
- Use of assessment strategies in the everyday teaching and learning of Integrated Science according to Bloom's Taxonomies which is divided into three categories are not practiced on daily bases instead teachers relay on Formative assessment as the only way of assessing learner.

Young (2009), in his presentation indicated that in a presentation if one stand and talk to group of people, those people will hear what the presenter is saying but most of them quickly forget. And if in a presentation, one uses power point then the audience would remember. However if people are mentally and physically involved then they will understand. In a class room situation un-resourced school learners undergo hear and forget phenomenon as the teachers do the talking as if the students are empty vessels. On the other hand, under-resourced school learners undergo see and remember phenomenon because teachers do demonstration with the little apparatus the school have not giving learners chance to do experiments on their own. But with resourced schools learners undergo do and understand phenomenon as learners have chance of doing experiments own their own using apparatus to facilitate learning.

Young (2009) phenomenon is supported by the Ministry of Education (2008) which indicates that, Integrated Science is a practical subject that needs learners to do practical in order to understand not watch or listen to their teacher doing things for the learners. Furthermore Pitout (2009) points out that outputs are the main focus in the learner-centered model: what knowledge have learners actually acquired, and what abilities have they actually developed? He further indicates that implicit in the learner-centered model is the idea that teachers are facilitators of learning. It is not enough to construct a syllabus and present information; the job of teachers now involves creating and sustaining an effective learning environment based on a wide range of best practices in teaching and learning (Ministry of Education, 2008).

5.5 Chapter Summary

This chapter focused on data presentation analysis and discussion. It started with the description of the participants which might have influenced their experiences and practice in the teaching and learning of form three integrated science. Considering participants in their classes and their biographies these could lead to different conclusions about the outcomes and assessment strategies of form three integrated science. Data generated implies that these teachers are faced with different challenges with regard to outcomes and assessment strategies. The next chapter is going to outline the summary of the study and the main conclusions. It would further present recommendations derived from the findings.

CHAPTER SIX

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

The previous chapter dealt with data presentation, analysis and discussion. In this chapter the summary, main conclusions and recommendations are presented. After careful considerations of the data, certain clear conclusions emerge in terms of critical questions formulated in chapter one. Based on the emerging issues outlined in chapter four and the conclusions of this study, pertinent recommendations are made.

6.2 Summary

The study focused on understanding the experiences and practice of Form Three Integrated Science teachers with regards to outcomes and assessment strategies. The study further attempt to understand why the teachers experience the outcomes and assessment the way they experience.

Chapter One outlined the problem and stated the aim of the study. The chapter outlined the historical background of Education in Lesotho which included; shifting from teacher-centred to learner-cantered with the purpose of giving learners opportunity for hands on activities for example in the laboratory learners are expected to conduct experiment and the teacher acts as the facilitator. The Chapter One also, looked at preparation and implementation of policy documents such as education reform for self reliance which was related to curriculum and assessment in a way that this curriculum aimed at inclusive education in all levels. All these implementations and shifting are monitored by the NCDC through the subject panels. This chapter again outlined importance of attaining good foundation of Integrated Science as it is a pre-requisite for learners into senior level. In line with the syllabus the emphasis is to develop scientific skills, positive attitude and to acquire all the necessary basic information about Science. The chapter concluded by highlighting the limitation of the study, that the study was conducted in a two schools and therefore the findings of the study were not going to be easily generalisable to other schools.

Chapter Two reviewed literature. Chapter Two reviewed concepts of outcomes and assessment strategies of which the fundamental role of assessment was considered and different ways of using assessment in the teaching and learning Integrated Science which are assessment strategies together with their advantages and disadvantages. Through good practice of assessment the teacher manages his/her planned learning outcomes of which these two: assessment strategies and outcomes cannot be divorced.

This chapter also looked at validity and reliability of assessment which is connected assessment of Integrated Science in Lesotho. Chapter Two further considered outcomes of Form Three Integrated Science (from broad outcomes to learning outcomes. Similarly the advantages and disadvantages were taken into account like it was said earlier that assessment strategies and outcomes cannot be separated. All these were based on the experiences and practice of Form Three Integrated Science teachers. The chapter concluded by looking at the theoretical and conceptual frame of inquiry.

Chapter Three described the methodology of the study. The study adopted the qualitative research design approach and is located in the interpretivism paradigm. The research was a case study of two schools, School A and School B (pseudonym). The study used interviews, observations and document reviews as data collection instruments. This chapter concluded by looking at the challenges the researcher came across during data production.

Chapter Four presented and discussed the findings. This was done through key questions which lead to presentation of themes/findings, namely the challenge, importance of learning outcomes, slow learners and finally assessment strategies findings reveal that two respondents out of three were not adequately trained for the teaching and learning of Form Three Integrated Science and therefore lacked essential skills and knowledge to carry out their duty of facilitating learners towards achieving broad outcomes set by the Ministry of Education and NCDC.

Moreover, the findings revealed that teacher are more interested in their areas of specialisation from the universities and colleges and this resulted with some other parts of the syllabus being sidelined. This chapter also revealed that teachers still lack

knowledge of stating or writing observable and measurable learning outcomes even though they are aware of the importance of stating learning outcomes at the beginning of each and every Integrated Science lesson.

6.3 Conclusions

The conclusions are derived from the findings of the study and will be discussed according to the research questions that guided the study.

The Ministry of Education took a step in providing quality education to all Basotho learners in secondary schools. This was done by introducing continuous assessment to cover areas that were not taken into account by examination and linking between outcomes and assessment strategies so that by the end of learning process learners are contributing towards the economy of the country.

The findings indicated that the teachers training of Integrated Science in universities and colleges which changed from Integrated Science to discipline training is not working, because teachers still have to teach Integrated Science in schools as a compulsory subject. As the result of these the findings show that there is imbalance of the teaching of three components of Integrated Science by these teachers. This contradicted with the Ministry of Education Policy document which states that there must be emphasis on the development of appropriate scientific skills and attitudes in addition to acquiring knowledge (Ministry of Education, 2008).

Furthermore, the syllabus document from NCDC recommends that the teaching and learning of Integrated Science must include experiments, inquiry through investigations and projects involving analysis, synthesis and designing of articles/ items. These approaches according to the findings are not taken into consideration because teachers lack knowledge on the content they have to use when facilitating the learning and teaching of Integrated Science. This could be the reason why two of the participants out of three displayed their limited knowledge on some other parts of Integrated Science and as a result their JC results are not the same as the results from the other participating school.

It was also recovered that as much as teacher use learning outcomes in their classrooms there is still a need for those outcome to be measurable and observable. In their classroom they were aware of the importance of using assessment strategies hand in hand with learning outcomes, however questions that they used were meant to achieve the stated learning outcomes of the day.

Due to the limited knowledge of proper stating of the learning outcomes one participant revealed that he is not sure if the way he stated his learning outcomes was correct. This implies that the training of teachers in colleges and universities have to take into consideration the proper way of making observable and measurable learning outcomes. This was in contradiction with Ferns and Aziz (2005) as they point out that it is important when learning is linked to clear statement of what learner is expected to achieve and how he or she is expected to demonstrate that achievement.

The findings reveal that most respondents were less knowledgeable about the other parts of Integrated Science as they were trained on particular parts of this subject so dealing with those parts they know less was difficult. This suggested that there was less or no proper training on other parts of Integrated Science. For this subject to be well taught and be successful, the training should consider the fact that Integrated Science in Form Three is compulsory.

The findings further reveal that the Ministry of Education is not doing enough in support of these teachers as one participant indicated that he did not benefit from the workshops he used to attend. For quality and proper acquiring of skills by learners, teachers should be well equipped so that they can facilitate the learning of Integrated Science in Form Three as this is a stepping stone to learners' choices for their senior Science discipline.

6.4 Suggestions for further research

This study has implications for further research especially in the area where learners' experiences in the teaching and learning of Integrated Science in secondary schools would be covered. Research on the effect of learners in senior level as they are choosing different disciplines of science as their areas of specialisation from their previous experience of Junior level. Furthermore, teachers' feelings about the teachers'

professional development with regard to the teaching and learning context in Lesotho. Furthermore the study was conducted in two school context which were similar, so to make it more interesting different context can be used, as a result there is a limitation for this study to be generalise because only two schools were involved with three participants from those school whereas Lesotho is having more than two hundred secondary schools

6.4 Recommendations

The recommendations given below are informed by the conclusions above, therefore these recommendation are as follow:

Recommendation One

The training of Integrated Science teachers in colleges and universities should be revisited. The reason being that one participant who was trained on this subject indicated no problems with regard to outcomes and assessment strategies of Form Three Integrated Science, or the tertiary institutions should involve the training of Integrated Science as it was done years before. This means that as much as teachers are trained on areas of specialisation the fact that they are bound to teach Integrated Science in schools must be considered during their training.

In addition, content and basics for other parts of Integrated Science that they are not dealing with should be included in the curriculum of the tertiary institutions. This could alleviate the problems that teachers come across when they start their duty as Integrated Science teachers and improve the JC results of this subject in schools where there are no teachers who were trained on Integrated Science. Furthermore, during the training proper way of having learning outcomes should be considered so that teachers are dealing with these learning outcomes in a way that they are observable and measurable.

Recommendation Two

There is a need for the Ministry of Education to implement networking amongst teachers through workshops as this could make teachers share their views in different fields of Integrated Science and also networking could help to have different strategies of handling slow learners in their Integrated Science classes. As we know that teaching and learning is not a once off event, but is a continuous process, that needs improved teacher development, the workshops and networking of teachers should be implemented in schools and regions. This means that the Ministry of Education should take into account the importance of in-service training to facilitate proper learning of Integrated Science.

Recommendation Four

The Ministry of Education should stick to one strategy for improving quality education until teachers are well acquainted with it. And then help teachers with workshops and possibilities of networking after they finish their training in tertiary institutions. The purpose being to help teachers broaden their knowledge and understanding as they start working.

Recommendation Five

While it is good to learn from others in their schools, in their regions, nationally and from other countries as to how they provide quality education, it is equally good to take the context into consideration before adopting foreign ideas. This means that what is good for one school, may not be good for the other after networking but the changes may be made to suit the context of each school through close monitoring and supervision the subject panel from NCDC. Through the help of NCDC, teacher should continue learning from each other and being given time to be addressed by the members of NCDC subject panels in relation to what is expected and what is not expected.

6.5 Chapter summary

This chapter has outlined the summary of the study and the main conclusions. It further presented recommendations derived from the findings.

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11 July 2011

Ms TB Khanare (209532013)
School of Education Studies
Faculty of Education
Edgewood Campus

Dear Ms Khanare

PROTOCOL REFERENCE NUMBER: HSS/0471/011M

PROJECT TITLE: Experiences and practices of Form Three Integrated Science teachers with regards to Outcomes and assessment strategies: A case study of two secondary schools in Lesotho

In response to your application dated 6 July 2011, the Humanities & Social Sciences Research Ethics Committee has considered the abovementioned application and the protocol has been granted **FULL APPROVAL**.

Any alteration/s to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through the amendment /modification prior to its implementation. In case you have further queries, please quote the above reference number.

PLEASE NOTE: Research data should be securely stored in the school/department for a period of 5 years.

I take this opportunity of wishing you everything of the best with your study.

Yours faithfully

.....
Professor Steven Collings (Chair)
HUMANITIES & SOCIAL SCIENCES RESEARCH ETHICS COMMITTEE

cc. Supervisor: Dr SB Khoza
cc. Mr N Memela/Ms T Mnisi



Founding Campuses: ■ Edgewood ■ Howard College ■ Medical School ■ Pietermaritzburg ■ Westville

APPENDIX B

P.O Box 146
Maputsoe, 350
Lesotho
9th June, 2011

Dear Senior Education Officer
Ministry of Education
Leribe

Dear Sir/Madam

Re: Request to collect data from the JC Science teachers

I am undertaking a research project on “Experiences and practices of Form Three Integrated Science Teacher with regard to outcomes and assessment strategies”. Therefore, it will be highly appreciated if your school could participate, please start by filling the attached declaration.

Research findings are influencing the way in which people are being educated and trained. I learnt that learners are not performing well in this subject as compared to the other subjects and the product of the training that was discipline based I want to conduct the study in order to find out from other Science teachers who undergo the same training about their perceptions of outcomes and assessment strategies.

Please take note of the following issues:

1. There will be no benefit that the participants may receive as part of their participation;
2. Respond to each question in a manner that will reflect your own personal opinions;
3. Your identity will not be divulged under any circumstance;
4. There are no right or wrong answers;
5. All the responses will be treated with strict confidentiality;
6. Real names of schools and participants will not be used;
7. The participants are free to withdraw from the research at anytime without any negative or undesirable consequences to themselves;
8. Participants will not be forced to reveal what they do not want to reveal;
9. No video recording will be made but voice recorder will be used for the interview.

This research project is supervised by Dr Khoza. His telephone number is (031) 260 7595 at University of KwaZulu-Natal and his email address is khozas@ukzn.ac.za.

Thank you for your support, co-operation and valuable time: Best wishes from

.....
Ts`episo Khanare
(University of KwaZulu-Natal student number 209532013)

APPENDIX C

P.O Box 146
Maputsoe, 350
Lesotho
9th June, 2011

Dear Principal

Re: Request to collect data from the JC Science teachers

I am undertaking a research project on “Experiences and practices of Form Three Integrated Science Teacher with regard to outcomes and assessment strategies”. Therefore, it will be highly appreciated if your school could participate, please start by filling the attached declaration.

Research findings are influencing the way in which people are being educated and trained. I learnt that learners are not performing well in this subject as compared to the other subjects and the product of the training that was discipline based I want to conduct the study in order to find out from other Science teachers who undergo the same training about their perceptions of outcomes and assessment strategies.

Please take note of the following issues:

10. There will be no benefit that the participants may receive as part of their participation;
11. Respond to each question in a manner that will reflect your own personal opinions;
12. Your identity will not be divulged under any circumstance;
13. There are no right or wrong answers;
14. All the responses will be treated with strict confidentiality;
15. Real names of schools and participants will not be used;
16. The participants are free to withdraw from the research at anytime without any negative or undesirable consequences to themselves;
17. Participants will not be forced to reveal what they do not want to reveal;
18. No video recording will be made but voice recorder will be used for the interview.

This research project is supervised by Dr Khoza. His telephone number is (031) 260 7595 at University of KwaZulu-Natal and his email address is khozas@ukzn.ac.za.

Thank you for your support, co-operation and valuable time: Best wishes from

.....

Ts`episo Khanare

(University of KwaZulu-Natal student number 209532013)

INVITATION TO PARTICIPATE

If you would like your school to participate in this research, please sign the following declaration and include the full names as indicated:

I(full names of the principal of participating school) hereby confirm that I understand the contents of this document and the nature of the research project, and I consent to participating in the research project. I understand that I am at liberty to withdraw from the project at any time, should I so desire.

.....
SIGNATURE

.....
DATE

APPENDIX D

P.O Box 146
Maputsoe, 350
Lesotho
9th June, 2011

Dear Teachers

Re: Request to collect data from the JC Science teachers

My name is Ts`episo Khanare. I am an education student at the University of KwaZulu-Natal. As part of my studies, I am undertaking some research. The area I am looking into is the teaching and learning of Science at junior certificate level. My focus is on the outcomes and assessment strategies in the teaching and learning of Science. The head of your school has granted me permission to get some information from you. I will have class observations and some interviews concerning your experiences and practises of outcomes and assessment strategies in Science. If you agree, I will request you to sign the attached consent form. Please note that participation in this study is voluntary. Withdrawal from it is possible at any stage.

I undertake to protect your identity. Your name and contact details will be kept in separate file, for verification of information at a later stage. The information you will provide will be used purely for research purposes. It may also be shared with other members of the Science education community in conferences or journals. In cases where such happens, you will be referred to by a fictitious name.

Should you need any further information, feel free to use any of the following contacts:

South Africa: (0027) – 739 558 844

Lesotho: (00266) – 58002591

E-mail: tkhanare@gmail.com or 209532013@ukzn.ac.za.

Thank you for your support, co-operation and valuable time: Best wishes from

.....

Ts`episo Khanare

(University of KwaZulu-Natal student number 209532013)

INVITATION TO PARTICIPATE

If you would like your school to participate in this research, please sign the following declaration and include the full names as indicated:

I(full names of participant) hereby confirm that I understand the contents of this document and the nature of the research project, and I consent to participating in the research project.

I understand that I am at liberty to withdraw from the project at any time, should I so desire.

.....
SIGNATURE

.....
DATE

PARTICIAPANTS BIOGRAPHY

Please indicate your response by making a tick or cross in the appropriate box.

1.1 Gender Male ☐ Female ☐

1.2 Age:

18 – 20 ☐

21 – 30 ☐

31 – 40 ☐

41 – 50 ☐

51 – 60 ☐

1.3 Highest educational qualification held:

1.4 Major(s) or subjects of specialisation:

1.5 Teaching Experience:

1.6 Current subjects teaching (Junior Level)

APPENDIX E

OBSERVATION SCHEDULE

1. How do teachers introduce their lessons?
2. Was the introduction related to learning outcomes? How?
3. How were learners involved towards achieving the stated learning outcomes?
4. What type of assessment/s was involved during the lesson?
5. How was assessment related to state learning outcomes?
6. Were the outcomes measurable and observable?

INTERVIEW SCHEDULE (SEMI-STRUCTURED INTERVIEW)

1. What is the purpose/s of outcomes in the teaching of Integrated Science?
2. How do you state the learning outcomes at the beginning of your lesson?
3. What type of outcomes do you make? Please give examples of how you state them.
4. Why do you state them in the way that you do?
5. How do you check the progress or gaps in the teaching of Integrated Science?
6. What is the purpose of assessment strategies in this subject?
7. How do you use them? Any variation or not?
 - Which ones work best for you?
 - Do you give other strategies chance or rely on only one strategy?
 - Can you elaborate?
8. Why do you use them in the way you do?
9. What kind of challenges do you come across in relation to outcomes and assessment strategies of Integrated Science?
10. Tell me more about your challenges.
11. How do you overcome or deal with the challenges?

APPENDIX F

SAMPLE OF TRANSCRIBED LESSONS

PARTICIPANT A1

- Participant A1: Good morning
- Class: Morning sir
- Participant A1 : How are you?
- Class: Fine.
- Participant A1 : Ahh..., okey I want you to tell me, in most sports grounds there is a middle line and also a circle in the middle of the play ground, now what do we call that circle at the middle of the ground?
- Student 1: We call it a centre. (Not clearly heard)
- Participant A1 : We call it a centre. Do you agree with student 1.
- Class: Yes sir.
- Participant A1 : So now I would like us to talk about the centre of gravity, centre of gravity centre of gravity. This is our main topic so now, those who have rulers, 30 cm ruler, use your fingers or sharp object and try to see where your ruler balance, try to see where your ruler balance, or you can even take your notebook, using your ruler and notebooks. Ok, so you have done it.
- Class: Yes sir.
- Participant A1 : In which position does your ruler or notebook balance? In which position does your ruler or notebook balance?
- Student 2: The ruler balance at the middle position.
- Participant A1: The ruler balance at the middle position, eer.... meaning therefore that a 30cm ruler balance at At what position does it balance, yes student 3.
- Student 3: It balances at 15cm.
- Participant A1 : What about your note book where does it balance, yes student 4.
- Student 4: It balances at the middle position.
- Participant A1 : It balances at the middle position, at the middle position. So eer, we can make a conclusion that a regular object balances at the middle position.
- Participant A1 and class: They balance at the middle position.
- Participant A1 : For instance the ruler balances at 15cm position. What will happen if you try to move your finger or your pen away from the middle position? What do you think will happen?
- Class: Sir?
- Participant A1 : What do you think will happen? Yes student 5.
- Student 5: The ruler will fall when you move the pen or the finger.
- Participant A1 : so your finding is that it is going to fall, so meaning if you try to shift the position of the pen or the finger the ruler is going to topple, we say that it is going to topples, it is going to topple.
- Participant A1 and class: It is going to topple.
- Participant A1 : So let us see how we can define the word centre of gravity can you try to work in pairs and give out your opinions, how can you define the centre of gravity? How can you define the centre of

- gravity? Try to discuss how you can define eer..., centre of gravity, centre of gravity, centre of gravity. Err student 6 you have an idea of how to define centre of gravity, the centre of gravity.
- Student 6: could not be heard.
- Participant A1 : They said speak aloud.
- Student 6: Centre of gravity is the point at which all forces are acting on the object.
- Participant A1 : Is what?
- Student 6: Is the point at which forces act on the object
- Participant A1 : Is the point at which forces act on the object while what?
- Student 6: While it balance.
- Participant A1 : :That is what I said and where it balance. Eer..., what else can you say, I have seen many hands like I said you discuss first, yes student 7
- Student 7: Is the point where the weight of an object is acting.
- Lentsoe: Is the point where the weight of an object is acting. What else do you have about the definition, yes student 8?
- Student 8: Is the point at which an object balances.
- Participant A1 : Is the point at which an object balances. So from these definitions that we have on the board, so do you think they are similar or different? Are they similar or are they different? Are they similar or are they different?
- Class: They are similar.
- Participant A1 : Meaning eer..., what you have is correct, so my definition of centre of gravity is the point at which the body balances it is the point where the whole weight of object seemed to act, it is a point where the weight of object seemed to act, it is a point where the weight of object seemed to act meaning we still have the same meaning. So who can wrap up what we have talked about before I can ask you questions. Who can wrap or summarize what we have talked about. Eer... just say what you have learnt.
- Student 9: (not clearly heard)
- Participant A1 : Can you speak aloud student.
- Student 9: We have learnt about the centre of gravity
- Lentsoe: Eehh..., what did we say about the centre of gravity?
- Student 9: We said the centre of gravity is the point at which, at which an object balance.
- Participant A1 : Centre of gravity is the point at which, at which an object balance, centre of gravity is the point at which, at which an object balance. What about the weight of that object? What about the weight of that object, yes student 10.
- Student 10: The weight of that object is acting at one point.
- Participant A1 : The weight of that object is acting at one point. Which is that point? Which is that point?
- Student 11: It is at the middle position where the object balances.
- Participant A1 and class: It is at the middle position where the object balances. It is at the middle position where the object balances.
- Participant A1 : Eer, what else have you learnt about the centre of gravity? What else have you heard about the centre of gravity? Or you just heard

that it is where the object balances. What about objects like the regular ruler? Objects like regular ruler? What can you say about its centre of gravity, what can you say about the centre of gravity of regular ruler? Eer.... student 12.

Student 12: It is easy to find the centre of gravity of a regular ruler.

Participant A1 : It is easy to find the centre of gravity of a regular ruler. How would you find it?

Student 12: When I take it, I put the finger or the sharp object in the middle where it balances.

Participant A1 : So that is how you find a centre of gravity of a regular ruler, you can find it by balancing it with a sharp object. You can find the centre of gravity of regular ruler by balancing it with a sharp object, what if you try to shift the position of the sharp object? What do you think will happen if you try to shift the position of a sharp object? Student 13

Student 13: It is going to topple or it is going to fall.

Participant A1 : It is going to topple or it is going to fall.

Participant A1 and class: It is going to topple or it is going to fall.

Participant A1 So that is all about the centre of gravity that is about the centre of gravity. So would you like to tell our visitor how was the lesson? Who can tell how the lesson was? Yes student 14, was it interesting or not interesting?

Class: Interesting

APPENDIX G

SAMPLE OF TRANSCRIBED SEMI-STRUCTURED INTERVIEWS

(PARTICIPANT A1)

PARTICIPANT A1 I am going to ask you questions about assessment strategies you use in your Integrated Science class in relation to outcomes that you have.

RESEARCHER: What do you think is the purpose of outcomes in the Integrated Science?

PARTICIPANT A1: the purpose of outcomes, in the Integrated Science er, I think is to improve learners with higher technology, they should be familiar with the technology and have inquisitive mind set even logical thinking.

RESEARCHER: thank you sir, when talking about Integrated Science what do you understand by it (integrated science)

PARTICIPANT A1: Integrated Science, eh eh we used to call it the physical sciences eh, it is related to things that we do in our everyday life. Eh in Physics we talk about electricity as one of many things that we experience in our life and in Chemistry we talk about Sodium Chloride which is our table salt and so many other things.

RESEARCHER: Ok sir, How mm at the beginning of the lesson how do you, how do you, how do you state the learning outcomes or the learning aims, your learning aims how do you go about when you get into the class?

PARTICIPANT A1: First, I should introduce the topic to learners so that they know what we are going to talk about. Then I will talk about the stated objectives that I have planed about then at the end of the lesson I will eh assess my learner by asking them some question or just tell the learners to summarise the topic that we talked about so that I can see if the objective have been achieved.

RESEARCHER: Thank you sir, I think you have already answered the next question so I will just go straight to the other one. What type of outcomes or objectives do you make in your class (integrated science) class.

PARTICIPANT A1: The type of objectives?

RESEARCHER: Are they, yah, what type?

PARTICIPANT A1: type eh, hei.

RESEARCHER: you are not sure?

PARTICIPANT A1: Yah, I am not sure.

RESEARCHER: Ok, how do you make your objectives to be observable, how do you make objectives eh towards testing them, eh I am thinking about measurable.

PARTICIPANT A1: Eh, I think objectives can be assessed by asking the learners questions to that you can see if they understood, eh even when they do not get the lesson what is all about so that you can see if the objectives have been achieved.

RESEARCHER: this means you use assessment in the learning and teaching of integrated science?

PARTICIPANT A1: Yes

- RESEARCHER: And this assessment which you use, are you using it towards achieving the objectives or are you, you are just using assessment?
- PARTICIPANT A1: No, I want to see whether I have achieved my objectives.
- RESEARCHER: Thank you sir, mmm how do you use assessment? I think I am repeating it, maybe I want to get something.
- PARTICIPANT A1: How do I use assessment?
- RESEARCHER: How do you use assessment?
- PARTICIPANT A1: Assessment, it can be by writing if I get your question right, learners should form some groups and discuss about the topic then they should provide their answers to the teachers so that they compare if they are correct or they give questions.
- RESEARCHER: so that is the way in which you assess them in the way that you do? Why do you, why do you, why do you like written test if you are using test, why would you choose to give a practical test if you are giving practical test. Why do you use those assessments in the way that you use them?
- PARTICIPANT A1: eh I think they are going to tell me how the learners get the topic or the yes I can call it topic for a day it they are given the topic tests it will tell me or it will measure how they understand that topic.
- RESEARCHER: This means that if you do not have a chance of giving them a test, we are now talking about the class level, we have only 40 minutes how would you use assessment in that type of situation, that is a short space of time because I think it is too short.
- PARTICIPANT A1: During the lesson, after passing maybe I have some stages after passing each and every stage I have to assess that stage so that I can see that learners get the main theme of the topic.
- RESEARCHER: So you ask them after certain stage you asked the questions in relation to the theme of the topic?
- PARTICIPANT A1: Yes
- RESEARCHER: So, when you are talking about assessment strategies because I can see that you are using the assessment to check your objectives or your outcomes. If that is the case, there is no way that does not have challenges. What are the challenges that you normally come across?
- PARTICIPANT A1: Eh, sometimes it may happen that there are some slow learners in your class and you find it difficult to diagnose their problems, do they understand and what they do not understand and so that one, maybe I can take the fast learners to a certain place and leave the slow learners so that I can come step by step with them giving them extra exercise and tutorials for the problems to solve and I think that one helped me even the learners to pass.
- RESEARCHER: This means you are trying to do what you can, are you, you are, as much as you can you are using assessment to help those who are not able to go fast because they not equal? Ok, so concerning those outcomes, those challenges that you normally come across. Ok you have already given me how you overcome the problems. So this means that er, er all in all if you want to, you are telling me, you want to tell me anything about outcomes and assessment strategies of Integrated Science it from the point that in the college and university we are trained on discipline based.

How can you say about the challenges that you come across when you started working. We are trained on discipline based that being the case, when you get to schools you are forced because Science is compulsory subject. You are forced to teach that Integrated Science. What are the things that you can say when we are looking at outcomes and assessment?

PARTICIPANT A1: Outcomes?

RESEARCHER: We are trained on discipline based that being the case, when you get to schools you are forced because Science is compulsory subject. You are forced to teach that Integrated Science because it is taught by Science teachers who have been trained on discipline base, you have been trained as Mathematics and Physics teacher, ok?

PARTICIPANT A1: Yes

RESEARCHER: But when you get here you were expected to teach Biology and Chemistry that you were never trained on when you were at the tertiary? Are there some challenges or not?

PARTICIPANT A1: Yes, there are some challenges of course maybe you are not familiar with those subject but what you have to do is to consult the people who know very much about the subject just to help you how you can approach the learners with that subject more especially I can say I hate Biology very much but then, I must teach it so I used to go to my colleague Mr Letata to get some help from him so that I can go to class and if I do not understand the topic clearly I had to ask him to teach it for me.

RESEARCHER: use consultations, with this one I just want you to be fair like you said you hate Biology, does it mean that when it comes to the syllabus which part of the syllabus do you like to finish or do you like to work on them?

PARTICIPANT A1: Generalize the Sciences or taking part of Biology?

RESEARCHER: Taking it from Integrated Science, we have Biology, Chemistry and Physics so I am saying when you get into your syllabus you have ten topics of Biology, ten topics of Chemistry and ten of Physics which part do you normally finish first?

PARTICIPANT A1: Physics part is the one that I normally finish first.

RESEARCHER:

What do you do in terms of parts that you are not confident with. As a teacher one sometimes feels I cannot go to class and embarrasses myself. What do you normally do in situations like this?

PARTICIPANT A1: I used to ask my colleagues about some topics in Biology and Chemistry and if I cannot grasp what they explained, I normally asked them to teach any particular part for me.

RESEARCHER: As far as the syllabus is concerned what can you say about the completion of it by the end of this year?

PARTICIPANT A1: Looking at the remaining part of the syllabus, I think I will manage to finish Physics part of the syllabus only and I will be left with five topics of Chemistry and about seven or eight of Biology

RESEARCHER: As far as I know the Ministry normally makes use of workshops for teachers in resource centres eg Leribe Resource centre, what can you say about the workshop if you ever attended any?

PARTICIPANT A1: Yes, there are some workshops that I attended arranged by the Ministry of Education. As much as I am new in this field they are not 100% effective. What I mean is that sometimes we go for one day workshop, after the workshop we are still lost because the presenter normally have a lot of information that need to be delivered at least for a week. So this make me always come back from these workshops being more confused.

RESEARCHER: Thank you sir for your time.

PARTICIPANT A2

PARTICIPANT A2 I am going to ask you questions about assessment strategies you use in your Integrated Science class in relation to outcomes that you normally have.

RESEARCHER: what type of assessment do you use to check if learning outcomes or objectives have been achieved?

PARTICIPANT A2: Ok madam, first thing is to evaluate, by evaluating, when evaluating I use oral questions or sometimes I give them test, I mean class work before they leave my class.

RESEARCHER: Ok, what do you understand by outcomes in Integrated Science. Ok I can say that err, this have been trigged by the fact that we are trained on discipline base, some of us are trained as science teachers but when we get to school we find that there is this thing called Integrated Science which is compulsory in the Secondary level. So from the college, coming to schools the doing the practical and then what do you understand by the outcomes in Integrated Science?

PARTICIPANT A2: The outcomes, eh maybe you can repeat the question so that I can understand maybe, er.

RESEARCHER: My question is eh, how can I put it eh, we are trained in colleges and universities on discipline base being a Biology and Chemistry teacher, Maths Teacher, Agriculture teacher but when we get to school we find that we must teach Integrated Science but when you are teaching it is not only the part that you were trained. So my question is now you are at the school dealing with Integrated Science what do you understand by outcomes in Integrated Science?

PARTICIPANT A2: Ok madam, I get you, it is sometimes difficult as I told you earlier that I did Agriculture but very unfortunately when I get here at Bohome High School I found that I must teach Science. So it is somehow difficult as a teacher to achieve the objectives and the eh, well the objectives, to achieve your aims because you did not do the subject that they force you to teach so I found it difficult or challenging.

RESEARCHER: Thank you sir, do you, how do you state the learning outcomes, now you are in the class ok, you have problem of not doing that particular subject, now you have to go to a class of which you have to have your learning outcomes spelled out to children. How do you give your learning outcomes?

PARTICIPANT A2:

ok in fact I used to state them eh, just to state them about eh what we are going to do on that day to make sure that they have done it and

RESEARCHER:

Do you have certain words or terms that you normally use?

PARTICIPANT A2:

Ok, I do not know if that words are wrong or not but I used to say eh today we are going to learn about something and that means at the end of the lesson I am expecting everyone to be able to define or explain, yes madam.

RESEARCHER:

So what type of outcomes or I think you have already answered it. Why do you state them in the way that you do?

PARTICIPANT A2:

Ok, I state them in that way or before I start my work because I have learnt that the learning outcomes/objectives help the learners to pay attention on what we are going to do on that particular day. That is why I used to state them before I can teach my lesson.

RESEARCHER:

Ok, so you are saying that is why you state them in the way that you do?

PARTICIPANT A2:

yes madam because they help them a lot, if I say you will be able to define that means when teaching in their mind they know that they cannot leave the class before they define particular term.

RESEARCHER:

What type of measurements do you use to check if your objectives or outcomes have been achieved?

PARTICIPANT A2:

Ok, eh a difficult question indeed but,

RESEARCHER:

But you have been doing it.

PARTICIPANT A2:

Yes madam but, like I have said, I used to ask them questions or give them the test or class work which tells me whether they have understood or not.

RESEARCHER:

so this means you use different types of assessment?

PARTICIPANT A2:

Yes madam, I use different types of assessment, sometimes I give them homework like I did today.

RESEARCHER:

So this means that oh, you have already answered the next question, what are the assessment strategies so this means that you are not looking at using homework?

PARTICIPANT A2:

Yes madam.

RESEARCHER:

Eh also you have already answered the next question which is how do you use them because you have already shown that you give them homework which they bring to class the next day ok.

PARTICIPANT A2: Yes madam

RESEARCHER:

Why do you use them in the way that you do? Why do not you use only verbal questioning at the end of the lesson?

PARTICIPANT A2:

Ok, I think in order for the learning to be successful, eh they have to answer in the classroom or again they should write it down to see as a teacher that they understand me because some of the learners understand better when they write others when they talk therefore I want to give every student an opportunity so that I will see as the teacher their weakness and where they lack some information.

RESEARCHER:

In the teaching and learning of Integrated Science em, em I do not know if you came across the challenges and let me start it. We are trained in colleges and universities on discipline base being a Biology and Chemistry teacher, Maths Teacher, Agriculture teacher but when we get to school we find that we must teach Integrated Science but when you are teaching it is not only the part that you were trained. So my question is now you are at the school dealing with Integrated Science, what kind of challenges can you talk about that are still going on that you would like to share with me?

PARTICIPANT A2:

Ok, there are many challenges, the first one, I am going to talk about few of them so the first one you will see as teachers we lack some information here and there for example I do not know anything about Physics and it is difficult to teach those topics for example waves and pressure and others so it is somehow challenging to teach the learners something you have not done because you need to read and read a lot therefore it is somehow so difficult, you are not able to express yourself in order to make your class so enjoyable.

RESEARCHER:

That is just too fair; you have been fair to me that you are not the physics person that indicates.

PARTICIPANT A2: Yes madam

RESEARCHER: I am going to ask you another question that I would like you to be genuine like you have just been. Which part of the syllabus do you normally finish first?

PARTICIPANT A2: It is Biology

RESEARCHER: Why Biology?

PARTICIPANT A2: Because I did Biology at COSC level and at tertiary I also did some of the topics that are related to Biology for example nutrition and anatomy, physiology that is why I use to finish Biology part before other parts.

RESEARCHER: Eh,

PARTICIPANT A2: and another part can be Chemistry because I also did Chemistry at COSC level and I encountered some of the topics at tertiary therefore it is not so difficult main problem is with Physics.

RESEARCHER: Eh, this means that Biology is your favorite part of the syllabus. So what do you do in terms of parts that you are not confident with. As a teacher one sometimes feels I cannot go to class and embarrasses myself. What do you normally do in situations like this?

PARTICIPANT A2: I normally go an extra mile by reading more about the topic that gives me problems and if I failed to get to root that is then that I asked for help from my colleagues.

RESEARCHER: What else can you share with me regarding the problems that you normally encounter?

PARTICIPANT A2: For the past three years I learnt that I never managed to finish the prescribed syllabus because Integrated Science is too broad as it involves three disciplines

PARTICIPANT A2: Yes madam.

RESEARCHER: As far as I know the Ministry normally makes use of workshops for teachers in resource centres eg Leribe Resource centre, what can you say about the workshop if you ever attended any?

PARTICIPANT A2: I sometimes attend those workshops however the workshops we ended are meaningless because they sometimes address one or two topic and this is one during one or two days. There is a lot of information which they expected us to gain within a very short length of time.

RESEARCHER: Thank you Participant A2, thank you very much.

PARTICIPANT B1

PARTICIPANT B1 I am going to ask you questions about assessment strategies you use in your Integrated Science class in relation to outcomes that you normally have.

RESEARCHER: As a teacher of Integrated Science, what do you think is the purpose of outcomes in the integrated Science class?

PARTICIPANT B1: I consider the purpose of the outcomes is to check whether you are adhering to the concepts that you are teaching.

RESEARCHER: Second question is how do you state the learning outcomes at the beginning of the lesson.

PARTICIPANT B1: To the learners or me as a teacher:

RESEARCHER: You can give as the teacher when writing your lesson plan or yes when you write your lesson plan and when you are with the learner because I do not know if the learners know what they are going to do.

PARTICIPANT B1: Yes it is important for learners to know what they are going to do.

RESEARCHER: Could you please tell me how do you do them when you write your plan and in the class.

PARTICIPANT B1: I am writing the learning outcomes at the end of Form A(1) If I am teaching Form A's, learners should be able to then I state the outcomes learning outcomes..... I think with learners I do not state them instead I consider them throughout the concepts when teaching. I check to see if they attain them.

RESEARCHER: So the outcomes or objectives are confusing in the sense that some are said to be not measurable or observable. Taking about measurable and observable what can you say to me about them?

PARTICIPANT B1: The, is that you can measure?

RESEARCHER: Yes.

PARTICIPANT B1: Maybe the observable or the ones that you can measure we can see them through their work, I think these ones occurred because they are observable. Maybe the non-observable can be observed later in their later stage of their lives they can be able to apply them. That is my understanding.

RESEARCHER: So sir we have talked about the outcomes or objectives in Integrated Science now the teaching is continuing, in your Integrated class how do you check the progress or gaps in your class.

PARTICIPANT B1: The progress of the learners or these outcomes?

RESEARCHER: The progress in terms of the attaining of the outcomes.

PARTICIPANT B1: Usually in my class, as in our Integrated Science we have books that have activities, so through the use of these activities they help us to see if the learners understand the concepts we are dealing and later at the end of the topic we normally give formal assessment where they are given question to answer.

RESEARCHER: Ok, does this mean that those activities are in the form of questions or sort of assessment.

PARTICIPANT B1: Yes

RESEARCHER: Do you give them during the lesson or they take them home?

PARTICIPANT B1: Activities, most of the time uses them during the lesson. And then at the end of the topic there are some questions that sometimes they take home, and these are formal question and it is done separately from the activities.

RESEARCHER: Ok, the activities they normally do them in the class and then the formal assessment they take it home. What do you think is the purpose of these assessments?

PARTICIPANT B1: Which one:

RESEARCHER: Assessment in general, the one we do in class as activities and the homework or the one they write at the end of the term, is not it assessment also?

PARTICIPANT B1: Yes, it is assessment. Ok, I consider not as much as to test but I consider that as a way of us teachers checking if we have achieved our objectives when teaching.

RESEARCHER: Do you use one method of assessment?

PARTICIPANT B1: No

RESEARCHER: There is variation.

PARTICIPANT B1: Yes, there is variation.

RESEARCHER: If there is variation, you have answered the question that follows, so the next one is: I did not asked you as an Integrated Science teacher, how were you trained: as Biology and Chemistry teacher, Physics teacher, Mathematics and Science teacher before we continue with the next question.

PARTICIPANT B1: I was trained as Integrated Science teacher.

RESEARCHER: Meaning you were trained as National Teacher Training College (NTTC)?

PARTICIPANT B1: Yes.

RESEARCHER: I understand, anyway there are some challenges in the field of teaching, in relation to outcomes and assessment of Integrated Science what are challenges do you normally come across since the beginning of your teaching. Can you please elaborate on those challenges?

PARTICIPANT B1: the challenges of teaching?

RESEARCHER: Yes, I do understand that your training was on Integrated Science, just give any challenges you came across.

PARTICIPANT B1: Challenges are many in the field of teaching. One of them is that in class learners are different therefore they do not get concepts at the same time, some are slow learners others are fast learners and this is a challenge, another thing is the syllabus, it is too broad, going back to slow learners you end up doing only half of your work for the year, then the following year you have to finish what was left previous year before you start the work of the next year. It is really challenging.

PARTICIPANT B1

RESEARCHER: Is this continuing problem?

PARTICIPANT B1: Yes

RESEARCHER: So far how do you try to overcome this problem?

PARTICIPANT B1: To overcome this I use remedial teaching, for example during study time sometimes I interrupt their study especially in the morning. Trying to help slow learners towards the fast learners and also I give them extra work which I have to mark and give back to learners to see how they cope.

RESEARCHER: Ok sir. Is there any other thing that you would like to share with me sir?

PARTICIPANT B1: Another thing is the syllabus, it is too broad, going back to slow learners you end up doing only half of your work for the year, then the following year you have to finish what was left in the previous year before you start the work of the next year. It is really challenging. Again I can say our learners seemed to have lost interest in their school work especially to read. I sometimes ask teachers of other subject if they have the same problem that we have in Science and they do have that problem. Learners seemed to have lost interest in reading.

Researcher: Going back to your lesson, the last thing you said is next time we are going to look at matter. My understanding is that you are giving them chance to read ahead. Are they doing that work or you have to start a fresh?

PARTICIPANT B1: When I come to class?

RESEARCHER: Yes, like you have already told them what you are going to do during the next lesson. Do they read or they do not?

PARTICIPANT B1: Very few do read, really there is a problem that I mentioned that learners seemed to have lost interest. Even with my own children at home I have to chase them to read instead they are interested in watching television or do other things or play games instead of reading.

RESEARCHER: Meaning there is a problem

PARTICIPANT B1: There is a problem.

RESEARCHER: As far as I know the Ministry normally makes use of workshops for teachers in resource centre eg Leribe Resource centre, what can you say about the workshop if you ever attended any?

PARTICIPANT B1: As a senior teacher and HOD I normally send junior staff teachers to the workshops because It is like we are wasting our time, it is much better to ask colleagues rather than going for eight hour workshop which will be covering a lot of information that cannot be handled.

RESEARCHER: Thank you very much for your time PARTICIPANT B1.

PARTICIPANT B1: Thank you madam.

